



**DRAFT REPORT
ROUND 7 DAM ASSESSMENT
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT
ASH POND 1 & 2 AND SLAG POND 1 & 2 IMPOUNDMENTS
NEW MADRID COUNTY, MISSOURI**

January 14, 2011

PREPARED FOR:



**U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460**

PREPARED BY:



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GZA File No. 01.0170142.20**

January 14, 2011
File No. 01.0170142.20

Mr. Stephen Hoffman
U. S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460



Re: Round 7 Dam Assessment - Draft Report
EPA Contract No. EP10W001313
Associated Electric Cooperative, Inc. New Madrid Power Plant
Ash Pond 1 and 2 Impoundments and Slag Pond 1 and 2 Impoundments
New Madrid County, Missouri

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Dear Mr. Hoffman:

In accordance with our proposal 01.P00000177.11, dated August 11, 2010, and U.S. Environmental Protection Agency (EPA) Contract No. EP10W001313, Order No. EP-CALL-0001, GZA GeoEnvironmental, Inc. (GZA) has completed our inspection of the Associated Electric Cooperative, Inc. New Madrid Power Plant, Ash Pond 1 and 2 Impoundments and Slag Pond 1 and 2 Impoundments located in New Madrid County, Missouri. The Site visit was conducted on October 6 and 7, 2010. The purpose of our efforts was to provide the EPA with a Site specific inspection of the impoundments to assist EPA in assessing the structural stability of the impoundments under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act Section 104(e). We are submitting one hard copy and one CD-ROM copy of this Draft Report directly to the EPA.

Based on our visual inspection, and in accordance with the EPA's criteria, the Ash Pond 1 and 2 Impoundments and Slag Pond 1 and 2 Impoundments are currently in **FAIR** condition, in our opinion. Further discussion of our evaluation and recommended actions are presented in the Round 7 Dam Assessment Report. The report includes: (a) completed Field Assessment Checklists; (b) figures of the impoundments; and (c) selected photographs with captions. Our services and report are subject to the Limitations found in **Appendix A** and the Terms and Conditions of our contract agreement.

We are happy to have been able to assist you with this inspection and appreciate the opportunity to continue to provide you with dam engineering consulting services. Please contact the undersigned if you have any questions or comments regarding the content of this Round 7 Dam Assessment Report.

Sincerely,

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PREFACE



The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations are beyond the scope of this report.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection, along with data available to the inspection team. In cases where an impoundment is lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions, which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is critical to note that the condition of the dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Prepared by:

GZA GEOENVIRONMENTAL, INC.

Patrick J. Harrison, P.E.

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EXECUTIVE SUMMARY



This Inspection Report presents the results of a visual inspection of the Associated Electric Cooperative, Inc. (AECI; Owner) New Madrid Power Plant (NMPP, Site) Coal Combustion Waste (CCW) Impoundments located in New Madrid County, Missouri. The inspection was performed on October 6 and 7, 2010 by representatives of GZA GeoEnvironmental, Inc (GZA), accompanied by representatives of NMPP.

The NMPP contains four earthen embankment CCW impoundments known as Ash Pond 1 (AP1) Impoundment, Slag Pond 1 (SP1) Impoundment, Ash Pond 2 (AP2) Impoundment, and Slag Pond 2 (SP2) Impoundment. The impoundments were constructed for the purpose of storing CCW waste and discharging plant wastewater.

The size of the impoundments was based on U. S. Army Corps of Engineers (COE) criteria. According to guidelines established by the U.S. Army COE, dams with a storage volume less than 1,000 acre-feet and/or a height less than 40 feet are classified as Small sized structures. As such, based on the maximum height of 12 feet and a storage volume of approximately 570 acre-feet, the AP1 Impoundment is considered a **Small** sized structure. Similarly, based on the maximum height of 20 feet and a storage volume of 14 acre-feet, the SP2 Impoundment is also classified as a **Small** sized structure.

According to guidelines established by the U.S. Army COE, dams with a storage volume between 1,000 and 50,000 acre-feet and/or a height between 40 and 100 feet are classified as Intermediate sized structures. As such, based on the maximum height of 20 feet and a storage volume of 1,137 acre-feet, the SP1 Impoundment is considered an **Intermediate** sized structure. Similarly, based on the maximum height of 20 feet and a storage volume of 1,351 acre-feet, it is GZA's opinion that the AP2 Impoundment is considered an **Intermediate** sized structure.

Hazard potential ratings have not been assigned by the Missouri Department of Natural Resources for the impoundments. However, under the State of Missouri classification system, it is GZA's opinion that the AP1 Impoundment, SP1 Impoundment, AP2 Impoundment, and SP2 Impoundment would be classified as **Environmental Class III** hazard structures based on the lack of conditions that warrant a Class I or Class II classification.

Similarly, under the EPA classification system, it is GZA's opinion that AP1 and AP2 Impoundments have a **Low** hazard potential and SP1 and SP2 Impoundments would be considered as having a **Significant** hazard potential.

Based on the results of the visual inspection, discussions with NMPP personnel, and a review of available design documentation, the four impoundments were judged to be in **FAIR** condition with the following deficiencies noted:

Ash Pond 1 (AP1) Impoundment

1. Poor vegetation and erosion on downstream slope where the security fence intersects the western embankment;
2. Minor sloughing in one area of the downstream slope of the western embankment;

3. Poor vegetation and erosion on the downstream slope near the road abutment near the northern corner of the impoundment;
4. Trees present on the downstream slope near the southwest corner of the embankment; and,
5. Poor access to the embankment that separates the AP1 Impoundment and SP1 Impoundment.



Slag Pond 1 (SP1) Impoundment

1. Erosion of the downstream slope near the northeast corner of the impoundment;
2. Forestation of the toe and downstream area east of the impoundment;
3. Trees present on the upstream slope of the southeastern embankment;
4. Unmaintained grass on the upstream slope of the southeastern embankment;
5. Wave action erosion of the downstream slope of the southeastern embankment; and,
6. Erosion ditch on the downstream slope near the intersection of the southeastern and southern embankments.

Ash Pond 2 (AP2) Impoundment

1. Minor sloughing in one area of the downstream slope of the western embankment;
2. Trees present on the downstream area of the southern embankment;
3. Erosion of the gravel access road on the southern embankment;
4. Unprotected Hyperflex© liner along the upstream slope on the eastern portion of the impoundment; and,
5. Sparse vegetation, rutting and wave action erosion of the downstream slope on the eastern embankment.

Slag Pond 2 (SP2) Impoundment

1. Trees present on the northeast portion of the downstream slope;
2. Eroded ditch near the northeast portion of the downstream slope;
3. Broad area of unprotected slope with generalized erosion on the downstream slope of the eastern embankment;
4. Rutting of the gravel access road on the crest of the eastern embankment;
5. Wave action erosion on the upstream slope near the southeastern corner of the impoundment;
6. Eroded ditch on the downstream slope near the southwest corner of the impoundment;
7. Sloughing on the downstream slope of the western embankment;
8. Erosion of the gravel shoulder of the crest access road on the western embankment;
9. Erosion of the gravel beneath the pipelines along the upper portion of the western embankment; and,
10. The toe of the northern portion of the western embankment has been excavated without an analysis of the impact to structural integrity and the surface was left unprotected. The western embankment is part of the Mississippi River levee system.

GZA recommends that the Owner perform the following analysis and studies:

Studies and Analyses:



1. Confirm that the elevation of the SP2 Impoundment embankments meet the State of Missouri and the COE requirements for industrial impoundments within the Mississippi River flood plain.
2. Perform a hydraulic/hydrologic analysis of the impoundments including the adequacy of the impoundments to accommodate the PMP event required by the State of Missouri and the COE.
3. Perform a complete structural and seepage analysis of the impoundments that includes an analysis of the stability of the impoundments during the PMP and flooding of the Mississippi River. The analysis should also account for surcharge loads created by the stockpiling of ash near the impoundment embankments.
4. Evaluate the extent of wave action on the impoundment embankments and impacts on the stability of the slope; repair as necessary.
5. Based on its position as a downstream pond in the water treatment and discharge of ash products at the NMPP, it is likely that the Raw Water Pond contains ash products. GZA recommends the Raw Water Pond be included in future inspections and be subject to the operations and maintenance recommendations made herein.
6. Develop an EAP to reduce the potential for property damage, environmental damage, and/or loss of life in the areas affected by an impending dam break.
7. Evaluate the cause of sloughing on the western embankment of the AP1 Impoundment and SP2 Impoundment.
8. Evaluate the impact of toe removal on the stability of the western embankment of the SP2 Impoundment; repair if necessary.
9. Conduct video inspection of outlet pipes from decant structures.
10. Obtain complete copies of the impoundment design and construction documentation from the designing engineers.



Operation & Maintenance Activities:

1. Increased mowing of the grasses on the embankments currently vegetated with tall grasses. The COE recommends vegetation be kept to less than 12 inches in height on embankments to facilitate inspections and reduce the risk of burrowing animals¹.
2. Routine measurements of the groundwater levels in the monitoring wells to evaluate changes in groundwater and seepage conditions.
3. Repair the erosion and grade the gravel access road on the southern embankment of the AP2 Impoundment to allow proper drainage.
4. Clear deep rooted vegetation from embankments, top of impoundments, and within 50 feet of the embankment toes as recommended by the COE.²
5. Topsoil and seed areas of poor vegetation in the AP1 Impoundment, AP2 Impoundment and SP2 Impoundment.
6. Provide protective cover over the Hyperflex© liner in the AP2 Impoundment.

Repair Recommendations:

1. Repair sloughed soil on the western embankment of the AP1 Impoundment.
2. Repair areas of erosion on the AP1 Impoundment, SP1 Impoundment, AP2 Impoundment, and SP2 Impoundment.
3. Repair rutting present on the SP2 Impoundment crest access road.

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¹ COE ETL 1110-2-571 "Guidelines For Landscape Planting And Vegetation Management At Levees, Floodwalls, Embankment Dams, And Appurtenant Structures", April 2009.

² Ibid.

ASH POND 1 AND 2 IMPOUNDMENTS AND SLAG POND 1 AND 2 IMPOUNDMENTS
ASSOCIATED ELECTRIC COOPERATIVE, INC. – NEW MADRID POWER PLANT
NEW MADRID COUNTY, MISSOURI



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1.0 DESCRIPTION OF PROJECT

1.1 General

1.1.1 Authority



The United States Environmental Protection Agency (EPA), has retained GZA GeoEnvironmental, Inc. (GZA) to perform a visual inspection and develop a report of conditions for the Associated Electric Cooperative, Inc. (AECI, Owner) New Madrid Power Plant (NMPP, Site) Coal Combustion Waste (CCW) Impoundments in New Madrid County, Missouri. This inspection was authorized by the EPA under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104(e). This inspection and report were performed in accordance with Request for Quote (RFQ) RFQ-DC-13, dated August 5, 2010 and EPA Contract No. EP10W001313, Order No. EP-CALL-01. The inspection generally conformed to the requirements of the Federal Guidelines for Dam Safety¹, and this report is subject to the limitations contained in **Appendix A** and the Terms and Conditions of our Contract Agreement.

1.1.2 Purpose of Work

The purpose of this investigation was to visually inspect and evaluate the present condition of the impoundments and appurtenant structures (the management unit) to attempt to identify conditions that may adversely affect their structural stability and functionality, to note the extent of any deterioration that may be observed, review the status of maintenance and needed repairs, and to evaluate the conformity with current design and construction standards of care.

The investigation was divided into five parts: 1) obtain and review available reports, investigations, and data from the Owner pertaining to the impoundments and appurtenant structures; 2) perform an on Site review with the Owner of available design, inspection, and maintenance data and procedures for the management unit; 3) perform a visual inspection of the Site; 4) prepare and submit a field assessment checklist; and 5) prepare and submit a draft and a final report presenting the evaluation of the structure, including recommendations and proposed remedial actions.

1.1.3 Definitions

To provide the reader with a better understanding of the report, definitions of commonly used terms associated with dams are provided in **Appendix B**. Many of these terms may be included in this report. The terms are presented under common categories associated with dams which include: 1) orientation; 2) dam components; 3) size classification; 4) hazard classification; 5) general; and 6) condition rating.

¹ FEMA/ICODS, April 2004: <http://www.ferc.gov/industries/hydropower/safety/guidelines/fema-93.pdf>

1.2 Description of Project

1.2.1 Location



The NMPP is located about three miles east of the city of Marston in New Madrid County, Missouri. The Site is accessible from the west via State Highway EE and from the north and south from Levee Road. The NMPP CCW impoundments are located near the power plant, which is located at latitude 36° 30' 56" North and longitude 89° 33' 47" West. A Site locus of the impoundments and surrounding area is shown in **Figure 1**. An aerial photograph of the impoundments and surrounding area is provided as **Figure 2**. The impoundments can be accessed by vehicles from earthen access roads from the NMPP.

1.2.2 Owner/Caretaker

The CCW impoundments are owned and operated by AECL.

	Dam Owner/Caretaker
Name	Associated Electric Cooperative, Inc. New Madrid Power Plant
Mailing Address	2814 S. Golden, P.O. Box 754
City, State, Zip	Springfield, Missouri 65801-0754
Contact	Duane Highley, PE
Title	Director, Power Production
E-Mail	duanehighley@aeci.org
Daytime Phone	(573) 643-2211
Emergency Phone	911 / (573) 379-0451 (Yard Superintendent Cell)

1.2.3 Purpose of the Impoundments

The NMPP is a two-unit coal-fired power plant, with a maximum generating capacity of approximately 1200 Megawatts. Unit 1 was constructed in 1972 while Unit 2 was constructed in 1977. Four earthen embankment CCW impoundments known as Ash Pond 1 (AP1) Impoundment, Slag Pond 1 (SP1) Impoundment, Ash Pond 2 (AP2) Impoundment, and Slag Pond 2 (SP2) Impoundment were constructed for the purpose of storing CCW waste and discharging plant wastewater.

The AP1 Impoundment and SP1 Impoundment were constructed in 1972 and function as sedimentation and storage basins for fly ash and boiler slag, respectively.² The SP2 Impoundment was constructed in 1984 and functions as a sedimentation and storage basin for boiler slag. The AP2 Impoundment was constructed in 1994 and functions as a sedimentation and storage basin for fly ash. The impoundments are located outside (on the river side) of the Mississippi River levee system. The top of embankment elevation of the AP1 Impoundment,

² Information regarding the materials received by each impoundment is based on the March 24, 2009 "Response to Request for Information Under Section 104(e) of the Comprehensive Environmental Response, Compensation, and Liability Act," from AECL to EPA.

AP2 Impoundment and SP1 Impoundment embankments generally matches the elevation of the Mississippi River levees.



1.2.4 Description of the Ash Pond 1 Impoundment and Appurtenances

Based on information provided by the NMPP personnel, the AP1 Impoundment was designed by Burns and McDonnell of Kansas City, Missouri. No construction documentation was available but a design drawing was provided by AECEI³. The following description of the AP1 Impoundment is based on: (a) the available design drawings; (b) the March 24, 2009 “Response to Request for Information Under Section 104(e) of the Comprehensive Environmental Response, Compensation, and Liability Act” from AECEI to the EPA (Response); (c) a slope stability analysis that was conducted for the impoundment embankments; (d) and information provided by NMPP personnel.

The AP1 Impoundment is located east of the NMPP and is roughly triangular in shape as shown in **Figure 3**. The eastern embankment of the AP1 Impoundment is shared with the SP1 Impoundment and the southern embankment is shared with the AP2 Impoundment. Most of the area of the AP1 Impoundment is filled with fly ash that has settled in-place or is stockpiled in the impoundment. Water and fly ash are discharged into the AP1 Impoundment via four pipelines located on the northern portion of the impoundment. The discharged water and ash flow through an approximately 7 foot deep channel in the stockpiled ash that is maintained through the removal of settled fly ash. The channel transports water through a channel between the embankment between the AP1 Impoundment and SP1 Impoundment and water then travels through the SP1 Impoundment. The ash that is removed from the channel is dewatered and stockpiled in the AP2 Impoundment as shown on **Figure 3**. The stockpiled ash is several feet above the embankment elevations in several areas.

The AP1 Impoundment consists of an earthfill embankment with a crest length of approximately 6,400 feet⁴ and a general height (from the lowest toe elevation to the crest of embankments) of approximately 12 feet. The impoundment is unlined and the embankments were constructed from native silty clay. The impoundment has a surface area of approximately 31 acres at a water level elevation of 303 feet Mean Sea Level (MSL) and the stockpiled ash occupies approximately 80 percent of the available storage capacity⁵. A gravel access road is present on the southern embankment crest and an asphalt access road is present on the western embankment crest. The crest elevation of the impoundment is approximately 310 feet MSL.⁶

Based on the design drawings provided and discussions with NMPP personnel, it does not appear the embankment was constructed over wet ash, slag or other unsuitable materials.

³ Drawing provided by AECEI titled: “Fly Ash Pond Improvement Plan View W/Contours”. Drawing generated by AECEI and dated 1989.

⁴ The length of the embankments for the impoundments was estimated by GZA using Google Earth Software.

⁵ The volume of ash provided for the impoundments was taken from the March 24, 2009 “Response to Request for Information Under Section 104(e) of the Comprehensive Environmental Response, Compensation, and Liability Act” from AECEI to EPA.

⁶ Elevations of the AP1 and SP1 impoundments were estimated by GZA from topographic contours provided in AECEI drawing titled: “Fly Ash Pond Improvement Plan View W/Contours” dated 1989.



The AP1 impoundment embankments were designed with 3 horizontal on 1 vertical (3H:1V) upstream and downstream slopes⁷. The western downstream slope was generally designed to be vegetated with grass. There is one groundwater monitoring well (P-5) located near the western embankment of the AP1 Impoundment.

1.2.5 Description of the Slag Pond 1 Impoundment and Appurtenances

Based on information provided by the NMPP personnel, the SP1 Impoundment was designed by Burns and McDonnell of Kansas City, Missouri. No construction documentation was available but a design drawing was provided by AECI⁸. The following description of the SP1 Impoundment is based on the available design drawing, the March 24, 2009 Response, a stability analysis that was conducted for the impoundment embankments, and information provided by NMPP personnel.

The SP1 Impoundment is located east of the NMPP and the AP1 Impoundment. The western, southern, and southeastern embankments of the SP1 Impoundment are shared with the AP1 Impoundment, the AP2 Impoundment and the Raw Water Pond, respectively as shown in **Figure 3**. Most of the area of the SP1 Impoundment is filled with fly ash that has settled and or has been stockpiled in the impoundment. Water and presumably ash enter the impoundment through a channel in the embankment between the AP1 Impoundment and SP1 Impoundment. The water flows through an approximately 7 foot deep channel in the ash delta and discharges to the Raw Water Pond through a channel in the southeastern embankment of the SP1 Impoundment. The stockpiled ash extends several feet above the embankment elevations in some areas.

The impoundment consists of an earthfill embankment with a crest length of approximately 6,700 feet and a general height (from the lowest toe elevation to the crest of impoundment) of approximately 20 feet. The impoundment is unlined and the embankments were constructed from native silty clays. The impoundment has a surface area of approximately 62 acres at a water level elevation of 303 feet MSL and the stockpiled ash occupies approximately 80 percent of the storage capacity. A gravel access road is present on the top of the southern and eastern portions of the impoundment. The crest elevation of the impoundment is approximately 307 feet to 310 feet MSL.

The SP1 Impoundment embankments were designed with 3H:1V upstream and downstream slopes without rip-rap or other protection against wave action erosion⁹. The downstream slope of the eastern embankment was generally designed to be vegetated with grass. There are three groundwater monitoring wells (P-1 through P-3) located along the eastern embankment of SP1 Impoundment.

⁷ Slopes based on Geotechnology, Inc. report "Global Stability Evaluation, Slag Pond 1 and Ash Pond 2, AECI New Madrid Power Generating Facility, New Madrid County, Missouri", dated July 31, 2009.

⁸ Drawing provided by AECI titled: "Fly Ash Pond Improvement Plan View W/Contours". Drawing generated by AECI and dated 1989.

⁹ Slopes based on Geotechnology, Inc. report "Global Stability Evaluation, Slag Pond 1 And Ash Pond 2, Aeci New Madrid Power Generating Facility, New Madrid County, Missouri", dated July 31, 2009.



1.2.6 Description of the Ash Pond 2 Impoundment and Appurtenances

Based on information provided by the NMPP personnel, the AP2 Impoundment was designed by Burns and McDonnell of Kansas City, Missouri. No construction documentation was available for the impoundment but three design drawings prepared by Burns and McDonnell and SLT North America, Inc. were provided by AECl. The following description of the AP2 Impoundment is based on: (a) the available design drawings; (b) the March 24, 2009 Response; (c) a stability analysis that was conducted for the impoundment embankments; (d) and information provided by NMPP personnel.

The AP2 Impoundment is located southeast of the NMPP and south of the AP1 Impoundment and the SP2 Impoundment. The northern and eastern embankments of the AP2 Impoundment are shared with the AP1 Impoundment, and the Make Up Water (MUW) Pond, respectively as shown on **Figure 4**. Most of the western portion of the AP2 Impoundment is filled with fly ash that has been stockpiled in the impoundment. When the impoundment is active, ash is trucked to the impoundment from the power plant. Water from the MUW Pond is used to sluice the ash from the truck into the AP2 Impoundment. The water for sluicing is controlled in the Compressor Building located on the northern embankment of the AP2 Impoundment as shown on **Figure 4**. The stockpiled ash extends several feet above the embankment elevations in some areas.

The AP2 Impoundment does not currently receive ash during normal operating conditions. The ash that previously was trucked to the AP2 Impoundment, is now being trucked to the dry ash landfill recently commissioned southwest of the impoundments (see location on Figure 2). Storm water runoff from the landfill collects in an evaporation basin. If the water level in the evaporation basin approaches the maximum operating level approximately 2 feet below the top of embankment, water is pumped to the AP2 Impoundment via high-density polyethylene (HDPE) pipelines that run along the crest of the southern embankment and discharge in the southeast corner of the AP2 Impoundment.

Water that enters the AP2 Impoundment through sluicing operations or pumping from the landfill storm water pond evaporates. If the rate of inflow exceeds the rate of evaporation, three approximately 8-inch diameter pipelines present in the northeast portion of the AP2 Impoundment transfer water by gravity to the SP2 Impoundment.

The AP2 impoundment consists of an earthfill embankment with a crest length of approximately 7,800 feet and a general height (from the lowest toe elevation to the crest of impoundment) of approximately 20 feet. The impoundment is lined and the embankments were constructed from native silty clays. The liner consists of 60 MIL and 80 MIL Hyperflex® that was placed on a prepared subgrade. Ash in the impoundment lies directly on the liner surface. The impoundment has a surface area of approximately 78 acres at a water level elevation of 303 feet MSL and the stockpiled ash occupies approximately 99 percent of the available storage capacity. A gravel access road is present on the impoundment crest. The crest elevation of the impoundment is approximately 307 feet MSL.¹⁰

¹⁰ Elevations of all impoundments are estimated from topographic contours provided in AECl drawing titled: "Fly Ash Pond Improvement Plan View W/Contours" dated 1989.



During high water events of the Mississippi River, pore pressures can build up under the liner present in the AP2 Impoundment. If left unmitigated, these pressures can lift the liner off the embankment slopes. To maintain positive downward pressure, water can be pumped from the MUW Pond to the AP2 Impoundment via two 18-inch diameter pipelines located on the downstream slope of the eastern embankment. The transfer pumps are manually controlled in the Pump Control Building on the crest of the eastern embankment.

The AP2 Impoundment embankments were designed with 3H:1V upstream and downstream slopes without rip-rap or other protection against wave action erosion¹¹. The downstream slope of the western and southern embankments was generally designed to be vegetated with grass. There are three groundwater monitoring wells (P-6 through P-8) located along the eastern and southern embankments of the AP2 Impoundment.

1.2.7 Description of the Slag Pond 2 Impoundment and Appurtenances

Based on information provided by the NMPP personnel, the SP2 Impoundment was designed by Burns and McDonnell of Kansas City, Missouri. No construction documentation was available for the impoundment but a survey drawing from December of 2005 was provided by AECI. The following description of the SP2 Impoundment is based on the available survey drawing, the March 24, 2009 Response, and information provided by NMPP personnel.

The SP2 Impoundment is located east of the NMPP and north of the AP1 Impoundment and the SP1 Impoundment as shown on **Figure 2**. Most of the northern portion of the SP2 Impoundment is filled with fly ash that has settled in-place or has been stockpiled in the impoundment. The northern portion of the impoundment is used as a processing area for recovered ash. Water and fly ash are discharged into the SP2 Impoundment via four pipelines located on the northern portion of the impoundment. The discharged water and ash flow through an approximately 3 foot deep channel into an ash delta that is maintained by removal of settled fly ash. Clarified water from the SP2 Impoundment is discharged to the Mississippi River through a decant structure located near the southeast portion of the impoundment. The pond water elevation is maintained by stop logs in the decant structure. The ash that is removed from the channel is dewatered and stockpiled in the SP2 Impoundment as shown on **Figure 3** until it is recycled or transported to the dry ash landfill.

The SP2 Impoundment consists of an earthfill embankment with a crest length of approximately 3,000 feet and a general height (from the lowest toe elevation to the crest of the impoundment) of approximately 20 feet. The impoundment is unlined and the embankments were constructed from native silty clays. The impoundment has a surface area of approximately 4 acres at a water level elevation of 299 feet MSL and the stockpiled ash occupies approximately 18 percent of the storage capacity. A gravel access road is present on the crest of the impoundment. The crest elevation of the impoundment is approximately 302 feet MSL which appears to be below the elevation of the Mississippi River levee system.¹² Based on information provided by NMPP, the impoundment has not experienced damage from flooding of the Mississippi River.

¹¹ Slopes based on Geotechnology, Inc. report "Global Stability Evaluation, Slag Pond 1 And Ash Pond 2, AECI New Madrid Power Generating Facility, New Madrid County, Missouri", dated July 31, 2009

¹² Elevations of all impoundments are estimated from topographic contours provided in AECI drawing titled: "Fly Ash Pond Improvement Plan View W/Contours", dated 1989.



The SP2 Impoundment embankments appeared to be designed with 4 horizontal on 1 vertical (4H:1V) upstream slopes and 2.5 horizontal on 1 vertical (2.5H:1V) downstream slopes without rip-rap or other protection against wave action erosion on the upstream slopes¹³. The downstream slopes were generally designed to be vegetated with grass. There are no survey monuments or other instrumentation associated with this impoundment.

1.2.8 Operations and Maintenance

The impoundments are operated and maintained by NMPP personnel. Operation of the impoundments includes operation of the stop logs in the SP2 Impoundment decant structure, as well as removal of settled ash from the AP1 Impoundment and the SP2 Impoundment. Maintenance of the impoundments includes regular (annual) mowing of the applicable downstream slopes.

Operation and maintenance of the NMPP facility, including the impoundments, is regulated by the EPA under the NPDES Permit No. MO-0001171. Based on the March 24, 2009 Response, the State of Missouri does not perform inspections of the impoundments or regulate the impoundments.

The NMPP personnel monitor the impoundments according to a series of informal and written protocols. These protocols include:

- Informal observation of the impoundment embankments during normal operations at impoundments; and,
- Semi-annual inspection of the impoundments by NMPP personnel.

1.2.9 Size Classification

For the purposes of this EPA-mandated inspection, the size of the impoundments was based on U. S. Army Corps of Engineers (COE) criteria. Based on the maximum height of 12 feet and a storage volume of approximately 570 acre-feet, it is GZA's opinion that the AP1 Impoundment is considered a **Small** sized structure. Based on the maximum height of 20 feet and a storage volume of 14 acre-feet, it is GZA's opinion that the SP2 Impoundment is also classified as a **Small** sized structure. According to guidelines established by the U.S. Army COE, dams with a storage volume less than 1,000 acre-feet and/or a height less than 40 feet are classified as Small sized structures. The maximum impoundment height and storage volume was based on information provided by the NMPP.

Based on the maximum height of 20 feet and a storage volume of 1,137 acre-feet, it is GZA's opinion that the SP1 Impoundment is considered an **Intermediate** sized structure. Based on the maximum height of 20 feet and a storage volume of 1,351 acre-feet, it is GZA's opinion that the AP2 Impoundment is considered an **Intermediate** sized structure. According to guidelines established by the U.S. Army COE, dams with a storage volume between 1,000 and 50,000 acre-feet and/or a height between 40 and 100 feet are classified as Intermediate sized structures. The maximum impoundment height and storage volume was based on information provided by the NMPP.

¹³ Slopes estimated by GZA from survey drawing generated by Smith & Co. titled "Pond at Outfall 004" and dated December 30, 2005.



1.2.10 Hazard Potential Classification

Hazard potential ratings have not been assigned by the Missouri Department of Natural Resources for the impoundments. However, under the State of Missouri classification system, it is GZA's opinion that the AP1 Impoundment, AP2 Impoundment, SP1 Impoundment, and SP2 Impoundment would be classified as **Environmental Class III** hazard structures based on the lack of conditions that warrant a Class I or Class II classification. Missouri State Rule 10 CSR 22-2.040 defines the environmental class structure as follows:

The downstream environment zone is the area downstream from a dam that would be affected by inundation in the event the dam failed. Inundation is defined as water, two feet (2') or more deep over the general level of the submerged ground affected outside the stream channel. Based on the content of the downstream environment zone, three (3) environmental classes are defined. They are: class I, which contains ten (10) or more permanent dwellings or any public building; class II, which contains one to nine (1-9) permanent dwellings, or one (1) or more campgrounds with permanent water, sewer and electrical services or one (1) or more industrial buildings; and class III, which is everything else.

Under the EPA classification system, as presented on page 2 of the EPA checklist (**Appendix C**) and Definitions section (**Appendix B**), it is GZA's opinion that the AP1 Impoundment and AP2 Impoundment would be considered as having a **Low** hazard potential. The hazard potential rating is based on no probable loss of human life and low probable economic or environmental losses due to impoundment failure. Probable impacts would be limited to the owner's property. The area downstream of the AP1 Impoundment and AP2 Impoundment is shown on **Figure 2**.

Under the EPA classification system, as presented on page 2 of the EPA checklist (**Appendix C**) and Definitions section (**Appendix B**), it is GZA's opinion that the SP1 Impoundment and SP2 Impoundment would be considered as having a **Significant** hazard potential. The hazard potential rating is based on impoundment failure resulting in no probable loss of human life, but could potentially cause environmental impacts and interruption of power generation. The area downstream of the SP1 Impoundment and SP2 Impoundment is shown on **Figure 2**.

1.3 Pertinent Engineering Data

1.3.1 Drainage Area

Based on the original design documents and as estimated by GZA, the AP1 Impoundment, SP1 Impoundment, AP2 Impoundment and SP2 Impoundment do not receive drainage from the surrounding areas under normal operating conditions. Water that enters the impoundments is from direct precipitation or from the NMPP operations (i.e. discharge of process water).



1.3.2 Reservoir

Based on information provided by the Owner, the AP1 Impoundment has an estimated surface area of 31 acres and a storage volume of 570 acre-feet¹⁴. The SP1 Impoundment has an estimated surface area of 62 acres and a storage volume of 1,137 acre-feet. The AP2 Impoundment has an estimated surface area of 78 acres and a storage volume of 1,351 acre-feet. The SP2 Impoundment has an estimated surface area of 4 acres and a storage volume of 14 acre-feet.

1.3.3 Discharges at the Impoundment Sites

Water that enters the AP1 Impoundment discharges into the SP1 Impoundment through an unlined channel in the embankment that separates the impoundments. Based on the information provided by NMPP, the channel is approximately 15 feet to 25 feet wide and located near the southeast portion of the impoundment.

Water that enters the SP1 Impoundment, discharges into the Raw Water Pond in an unlined channel through the southeastern embankment. Based on the design drawing provided, the discharge channel between the SP2 Impoundment and the Raw Water Pond is approximately 100 feet wide at the embankment crest. Water exits the Raw Water Pond through the decant structure on the southwest portion of the pond.

Bottom ash is transported to the AP2 Impoundment via trucks. Water that enters the AP2 Impoundment from direct precipitation evaporates.

Water that enters the SP2 Impoundment discharges to the Mississippi River through the decant structure located near the southeastern portion of the impoundment. The water levels in the SP2 Impoundment are controlled by stop logs in the decant structure.

1.3.4 General Elevations (feet – MSL)

Elevations were taken from design drawings, reports, and data provided by NMPP. Elevations were based upon the USGS topographic map MSL vertical datum.

Ash Pond 1 Impoundment (AP1)

A. Top of Embankment (Minimum)	310 feet
B. Upstream Water at Time of Inspection	± 303 feet ¹⁵
C. Downstream Tail Water at Time of Inspection	± 303 feet

Slag Pond 1 Impoundment (SP1)

A. Top of Embankment (Minimum)	307 feet
B. Upstream Water at Time of Inspection	± 303 feet
C. Downstream Tail Water at Time of Inspection	± 303 feet

¹⁴ Storage volume of the impoundments was based on allowable volume of ash storage, not maximum water level, as was provided by NMPP.

¹⁵ Upstream and downstream water elevations based on visual estimates by GZA for the impoundments.



Ash Pond 2 Impoundment (AP2)

A. Top of Embankment (Minimum)	307 feet
B. Upstream Water at Time of Inspection	300 feet

Slag Pond 2 Impoundment (SP2)

A. Top of Embankment (Minimum)	302 feet
B. Upstream Water at Time of Inspection	299 feet

1.3.5 Design and Construction Records and History

Based on information provided by NMPP personnel, the AP1 Impoundment, AP2 Impoundment, SP1 Impoundment, and SP2 Impoundment were designed by Burns & McDonnell. The ponds were reportedly constructed under the supervision of a professional engineer but no supporting construction documentation was provided by NMPP.¹⁶

1.3.6 Operating Records

No operations records are maintained for the impoundments.

1.3.7 Previous Inspection Reports

Visual observations of the impoundments are performed during normal operations but typically not documented. Visual inspections of the impoundments are conducted semi-annually by NMPP maintenance personnel. The visual inspections include observations of the exterior (downstream) and interior (upstream) slopes of the impoundment embankments. NMPP personnel provided GZA with inspection reports for the impoundments from the Spring of 2009 and November of 2009. The following deficiencies were noted in the November of 2009 inspection reports:

- Tree growth on downstream slope of the AP1 Impoundment and SP1 Impoundment near the Make Up Water pond;
- Tree growth on the upstream slope of the AP1 Impoundment and SP1 Impoundment; and,
- Erosion on the crest of the AP2 Impoundment.

Observed deficiencies are addressed by entering work orders into the NMPP task management software system to generate and track work orders. There was no documentation that the observed deficiencies were addressed.

2.0 INSPECTION

2.1 Visual Inspection

The NMPP impoundments were inspected on October 6 and October 7, 2010 by Patrick J. Harrison, P.E. and Douglas P. Simon of GZA GeoEnvironmental, Inc. The inspection was conducted over the course of two days. For both days, the weather was sunny with temperatures

¹⁶ Based on the March 24, 2009 "Response to Request for Information Under Section 104(e) of the Comprehensive Environmental Response, Compensation, and Liability Act," from AECl to EPA.



in the 70's to 80's Fahrenheit. Photographs to document the current conditions of the dam were taken during the inspection and are included in **Appendix D**. Underwater areas were not inspected, as this level of investigation was beyond of GZA's scope of services. A copy of the EPA Checklist and a separate copy of the GZA inspection checklist are included in **Appendix C**.

With respect to our visual inspection, there was no evidence of prior releases, failures, or patchwork observed by GZA.

2.1.1 Ash Pond 1 Impoundment General Findings

In general, the AP1 Impoundment was found to be in **FAIR** condition. An overall Site plan showing the impoundments is provided as **Figure 2**. The location and orientation of photographs provided in **Appendix D** is shown on the Photo Plan in **Figure 3**. The stockpiled ash was vegetated with tall grasses as shown in Photo 45 that limited our ability to locate the embankment that separates the AP1 Impoundment from the SP1 Impoundment. Therefore, the embankment could not be inspected.

2.1.2 Ash Pond 1 Impoundment Upstream Slope (Photos 43 through 49)

Ash has been stockpiled to an elevation approximately equal to or higher than the embankments in most locations of the AP1 Impoundment. Therefore, the upstream slope was covered by ash and not visible for inspection.

2.1.3 Ash Pond 1 Impoundment Crest (Photos 43 through 49)

The crest of the western embankment of the AP1 Impoundment consisted of a paved access road. The crest of the southern embankment had a gravel cover, with some grasses. The crest alignment appeared generally level, with no depressions or irregularities observed. Based on information provided by NMPP, the crest elevation was approximately 310 feet MSL. No significant settlement was observed at the time of our inspection. There was approximately 7 feet of free board at the time of our inspection.

2.1.4 Ash Pond 1 Impoundment Downstream Slope (Photos 50 through 57)

The downstream slope of the western embankment of the AP1 Impoundment was generally in good condition. The surface cover of the slope was grass that appeared to be regularly mowed. An area of minor erosion was observed where the security fence intersects the embankment slope as shown in Photo 57. Trees up to approximately 4 inches in diameter were observed around the light pole on the toe of the southwest corner of the embankment. No seepage or sloughing was observed on the western downstream slope.

The eastern embankment of the AP1 Impoundment separates the AP1 Impoundment from the SP1 Impoundment. The separation embankment could not be observed by GZA due to the height of the grass vegetation on the stockpiled ash.

The southern embankment of the AP1 Impoundment separates the AP1 Impoundment from the AP2 Impoundment such that the downstream slope of the AP1 Impoundment corresponds to the upstream slope of the AP2 Impoundment. The stockpiled ash in the AP2



Impoundment covers most of the slope. Where it is not covered by stockpiled ash, the upper few feet of the slope consisted of an exposed Hyperflex© liner. The liner generally appeared to be in fair condition.

2.1.5 Ash Pond 1 Impoundment Discharge Pipes (Photos 58 through 59)

Three 8-inch diameter pipelines discharge ash and water into the AP1 Impoundment. There were no leaks observed in the discharge pipes and there were no observed defects or areas of these structures that required repair.

2.1.6 Slag Pond 1 Impoundment General Findings

In general, the SP1 Impoundment was found to be in **FAIR** condition. An overall Site plan showing the impoundments is provided as **Figure 2**. The location and orientation of photographs provided in **Appendix D** is shown in the Photo Plan on **Figure 3**. The ash stockpiled in SP1 Impoundment was vegetated with tall grasses as shown in Photo 31 that limited our ability to locate the embankment that separates the AP1 Impoundment from the SP1 Impoundment. Therefore, the embankment could not be properly inspected.

2.1.7 Slag Pond 1 Impoundment Upstream Slope (Photos 31 through 33)

Ash has been stockpiled on the upstream slopes to an elevation approximately equal to the crest elevation along much of the eastern and southern embankments. Therefore, those portions of the upstream slope were covered by ash and not visible for inspection. The upstream slope of the southeastern embankment was vegetated with tall grass as shown in Photo 33 and limited GZA's access to the slope. Trees up to 4 inches in diameter were observed on the upstream slope of the southeastern embankment.

2.1.8 Slag Pond 1 Impoundment Crest (Photos 34 through 37)

The crest of the southern and eastern embankments of the SP1 Impoundment consisted of a gravel access road. The crest of the southeastern embankment had a grass cover that appeared to be regularly mowed. The crest alignment appeared generally level, with no depressions or irregularities observed. Based on information provided by NMPP, the crest elevation ranged from approximately elevation 307 feet to elevation 310 feet MSL. No significant settlement was observed at the time of our inspection. There was approximately 4 feet of free board at the time of our inspection.

2.1.9 Slag Pond 1 Impoundment Downstream Slope (Photos 38 through 42)

The downstream slope of the eastern embankment of the impoundment was generally in fair condition. The upper portion of the embankment was vegetated with grass that appeared to be regularly mowed. The lower 2 feet to 5 feet of the downstream slope and the toe of the embankment had mature trees up to approximately 18 inches in diameter as shown in Photo 39. The habitat in this area was consistent with mature forests with no grass undergrowth. An area of erosion was observed near the northeast corner of the downstream slope as shown in Photo 34. No seepage or sloughing was observed on the eastern embankment downstream slope.



The southeastern embankment of the SP1 Impoundment separates the SP1 Impoundment from the Raw Water Pond. The downstream slope of the SP1 Impoundment coincides with the upstream embankment of the Raw Water Pond. The water level in the Raw Water Pond was approximately at an elevation of 303 feet MSL at the time of GZA's inspection. GZA did not perform an underwater inspection of the slope as it was beyond the scope of work. There was wave action erosion on the downstream slope of the southeastern embankment. In addition, there was an eroded channel near the intersection of the southeastern and southern embankments.

The eastern portion of the southern embankment of the SP1 Impoundment separates the SP1 Impoundment from the MUW Pond. The western portion of the southern embankment of the SP1 Impoundment separates the SP1 Impoundment from the AP2 Impoundment. The downstream slope of the western portion of southern embankment coincides with the upstream slope of the AP2 Impoundment. The western portion of the downstream slope was covered with a Hyperflex© liner that was exposed from the crest to the pond water elevation and appeared to be in fair condition. The eastern portion of the downstream slope of the southern embankment was vegetated with grass and was generally in good condition.

The western embankment of the SP1 Impoundment separates the SP1 Impoundment from the AP1 Impoundment. The separation embankment could not be observed by GZA due to the height of the grass vegetation on the stockpiled ash. The northern portion of the impoundment is incised into the existing topography.

2.1.10 Ash Pond 2 Impoundment General Findings

In general, the AP2 Impoundment was found to be in **FAIR** condition. An overall Site plan showing the impoundments is provided as **Figure 2**. The location and orientation of photographs provided in **Appendix D** is shown in the Photo Plan on **Figure 4**.

2.1.11 Ash Pond 2 Impoundment Upstream Slope (Photos 60 through 70)

Along most of the northern, western and southern embankments of the AP2 Impoundment, ash has been stockpiled to an elevation approximately equal to the crest elevation. Water was present at an elevation of approximately 300 feet MSL on the eastern portion of the impoundment at the time of our inspection. GZA did not inspect those portions of the embankments that were covered by ash or water as it was beyond the scope of our work. Where otherwise not covered by ash or water, the upstream slope of the AP2 Impoundment was covered with a Hyperflex© liner that appears to be in fair condition.

2.1.12 Ash Pond 2 Impoundment Crest (Photos 68 through 73)

The crest of the AP2 Impoundment consisted of a gravel access road. The crest alignment appeared generally level, with no depressions or irregularities observed. Based on information provided by NMPP, the crest elevation is +/- 307 feet MSL. No significant settlement was observed at the time of our inspection. There was erosion in several areas of the gravel access road on the southern embankment as shown in Photos 72 and 73. There was approximately 7 feet of free board at the time of our inspection.



2.1.13 Ash Pond 2 Impoundment Downstream Slope (Photos 74 through 85)

The northern embankment of the AP2 Impoundment separates the AP2 Impoundment from the AP1 Impoundment and SP1 Impoundment. The downstream slope of the northern embankment was vegetated with tall grass as shown in Photo 77 and limited GZA's access to the slope.

The eastern embankment of the AP2 Impoundment separates the AP2 Impoundment from the MUW Pond. The water in the MUW Pond covered the lower portion of the downstream slope. The downstream slope of the eastern embankment was vegetated with sparse vegetation that appeared to be regularly mowed. Wave action erosion was present on the slope from waves in the MUW Pond. On the southern portion of the slope, wave action erosion has created a vertical slope which is approximately 3 feet in height. Ruts from equipment operation were also present on the slope at the approximate location shown on **Figure 4**. Two 18-inch diameter pipelines are present in the downstream slope of the eastern embankment as shown in Photo 86. The pipelines are used to transfer water from the MUW Pond to the AP2 Impoundment during high water events associated with the Mississippi River to provide positive downward pressure on the AP2 Impoundment liner.

The downstream slope of the southern and western embankment of the AP2 Impoundment was vegetated with grass that appeared to be regularly mowed. Trees up to approximately 4 inches in diameter were observed around the light pole on the toe of the northwest corner of the embankment. Sloughing was observed along the toe of the western embankment as shown in Photo 85. Trees up to 15 inches in diameter were present in the downstream area of the southern embankment.

2.1.14 Ash Pond 2 Impoundment Discharge Pipelines and Structures (Photos 86 and 87)

Three 8-inch diameter pipelines are used as an overflow control system to transfer water to the SP1 Impoundment from the AP2 Impoundment if the water levels in the AP2 Impoundment rise to invert elevations. There were no leaks observed in the discharge pipes and there were no observed defects or areas of these structures that required repair as shown in Photo 87.

Two control buildings are present on the crest of the AP2 Impoundment. The Compressor Building on the crest of the northern embankment functions as the control center for pumping water for sluicing ash into the AP2 Impoundment. The Pump Control Building on the crest of the eastern embankment functions as the control center for pumping water from the MUW Pond to the AP2 Impoundment as needed. The Compressor Building and the Pump Control Building are shown in Photos 65 and 62, respectively. The buildings were in good condition with no defects or need of repair observed.

2.1.15 Slag Pond 2 Impoundment General Findings

In general, the SP2 Impoundment was found to be in **FAIR** condition. An overall Site plan showing the impoundments is provided as **Figure 2**. The location and orientation of photographs provided in **Appendix D** is shown in the Photo Plan on **Figure 5**.



2.1.16 Slag Pond 2 Impoundment Upstream Slope (Photos 1 through 6)

The northern portion of the SP2 Impoundment is utilized for ash recovery operations. The stockpiled ash in this area is approximately at the same elevation as the impoundment crest. Water was present at an elevation of approximately 299 feet MSL on the southern portion of the impoundment at the time of our inspection. GZA did not inspect those portions of embankment that were covered by ash or water as it was beyond the scope of our work.

Where otherwise not covered by ash or water, the upstream slope of the SP2 Impoundment was vegetated with grass that appeared to be regularly mowed. Wave action erosion was noted in the southeastern portion of the impoundment.

2.1.17 Slag Pond 2 Impoundment Crest (Photos 7 through 12)

The northern, eastern and southern portions of the SP2 Impoundment crest consisted of a gravel access road. The western portion of the crest consisted of a paved levee access road. The crest alignment appeared generally level in most locations. Rutting of the gravel access road was observed on the southern portion of the eastern embankment as shown in Photo 7. Based on information provided by NMPP, the crest elevation varies approximately from an elevation of 302 feet to 307 feet MSL. There was erosion in several areas of the gravel shoulder on the western embankment access road. There was approximately 3 feet of free board at the time of our inspection.

The lowest crest elevation of the SP2 Impoundment is lower than the elevation of the adjacent Mississippi River levee. Based on information provided by NMPP personnel, the high water level of the Mississippi River was approximately 8 feet below the SP2 Impoundment crest elevation during the 1999 flood event. Reportedly, the 1999 flood corresponded to a 500 year event in that area. However, no formal evaluation has been conducted to evaluate the adequacy of the embankment height based on State of Missouri and COE requirements.

2.1.18 Slag Pond 2 Impoundment Downstream Slope (Photos 13 through 26)

Part of the northwest portion of the SP2 Impoundment is incised (i.e. cut section) into the existing topography and no downstream slope is present.

The downstream slope of the SP2 Impoundment included portions that were vegetated with grass that appeared to be regularly mowed, portions that consisted of rip rap, and portions that consisted of unvegetated soil prone to erosion. Trees up to 5-inches in diameter were noted near the northeast corner of the impoundment as shown in Photo 21. An eroded ditch was also present near the northeast corner of the impoundment in an area of unmaintained grass. An area of unvegetated soil with generalized erosion was noted on the downstream slope of the eastern embankment. An area of sloughing was noted on the southern portion of the western embankment.

A series of pipelines are present along the downstream slope of the western embankment. A leaking pipeline was noted along the western embankment near the southwestern corner of the impoundment. Fluid from the leaking pipe had eroded a channel in the downstream slope that was approximately 6 to 24 inches wide, 6 inches deep and 50 feet

long as shown in Photo 16. In addition, surface water runoff also appears to be eroding the gravel surface present on the upper portion of the downstream slope as shown in Photo 18.



A road is also present along the toe of the western embankment. It appeared that a drainage ditch had been recently cut into the downstream toe of the northern portion of the western embankment as shown in Photo 20. The ditch was approximately 2 feet to 3 feet deep and 15 feet wide. The ditch was unlined and no vegetation or other protective cover was present.

2.1.19 Slag Pond 2 Impoundment Discharge Pipelines and Decant Structures (Photos 27 through 30)

Four 10-inch diameter pipelines discharge ash and water into the SP2 Impoundment. There were no leaks observed in the discharge pipes and there were no observed defects or areas of these structures that required repair. Water is removed from the SP2 Impoundment through a decant structure near the southeast portion of the impoundment. The water level in the pond is controlled by concrete stop logs in the decant entrance. Water that enters the decant structure is discharge via an 18-inch diameter pipe along the lower banks of the Mississippi River as shown in Photo 29. The decant structure appeared to be in good condition with no observed defects that required repair.

2.2 Caretaker Interview

Maintenance of the impoundments is the responsibility of NMPP personnel. GZA met with NMPP personnel and discussed the operations and maintenance procedures, regulatory requirements, and the history of the impoundments since their construction.

2.3 Operation and Maintenance Procedures

NMPP personnel are responsible for the regular operations and maintenance of the impoundments. No written maintenance plan is in place for the impoundments. However, routine maintenance generally includes mowing of several of the downstream slopes. Routine operations include using stop logs to change the pond water levels in the SP2 Impoundment, periodic observations of the impoundments during routine tasks, and semi-annual inspection of the impoundments.

2.4 Emergency Action Plan

No Emergency Action Plan (EAP) has been developed to address potential impending failure of the impoundments at NMPP. Note that the hazard potential classification for the impoundments is discussed in Section 1.2.10.

2.5 Hydrologic/Hydraulic Data

GZA did not perform an independent assessment of the hydraulics and hydrology for the impoundments as this was beyond our scope of services. Based on information provided by NMPP personnel, a hydraulic or hydrology assessment of the impoundment has not been conducted.

2.6 Structural and Seepage Stability



Geotechnology, Inc., as a consulting engineer to the NMPP, performed a global stability evaluation of the area that included the AP1 Impoundment, SP1 Impoundment, and AP2 Impoundment as referenced herein. The evaluation included five soil borings drilled through the perimeter embankments to evaluate subsurface conditions. Geotechnology, Inc. performed a slope stability analysis based on the soil conditions encountered and the assumed conditions at the Site at the time of the evaluation using SLOPE/W. The analysis did not reflect the observed elevations of the ash in the impoundments and the potential impacts to stability. The results of the analysis were provided in their July 31, 2009 report and indicated the calculated factor of safety for global stability was 1.6 or greater during the conditions observed. The analysis also indicated a factor of safety of 1.0 during seismic loading. The reported factors of safety appeared to meet the requirements of the State of Missouri Rule 10 CSR 22-3.020.

The analysis did not evaluate the stability of the embankments during loading from the Probable Maximum Precipitation (PMP) event or seasonal events such as flooding of the Mississippi River and therefore may not represent the lowest expected factor of safety. GZA did not perform an independent structural and seepage analysis, as this was beyond the scope of work.

3.0 ASSESSMENTS AND RECOMMENDATIONS

3.1 Assessments

In general, the overall condition of the AP1 Impoundment was judged to be **FAIR**. The AP1 Impoundment was found to have the following deficiencies:

1. Poor vegetation and erosion on downstream slope where the security fence intersects the western embankment;
2. Minor sloughing in one area of the downstream slope of the western embankment;
3. Poor vegetation and erosion on the downstream slope near the road abutment near the northern corner of the impoundment;
4. Trees present on the downstream slope near the southwest corner of the embankment; and,
5. Poor access to the embankment that separates the AP1 Impoundment and SP1 Impoundment.

In general, the overall condition of the SP1 Impoundment was judged to be **FAIR**. The SP1 Impoundment was found to have the following deficiencies:

1. Erosion of the downstream slope near the northeast corner of the impoundment;
2. Forestation of the toe and downstream area east of the impoundment;
3. Trees present on the upstream slope of the southeastern embankment;
4. Unmaintained grass on the upstream slope of the southeastern embankment;
5. Wave action erosion of the downstream slope of the southeastern embankment; and,
6. Erosion ditch on the downstream slope near the intersection of the southeastern and southern embankments.



In general, the overall condition of the AP2 Impoundment was judged to be **FAIR**. The AP2 Impoundment was found to have the following deficiencies:

1. Minor sloughing in one area of the downstream slope of the western embankment;
2. Trees present on the downstream area of the southern embankment;
3. Erosion of the gravel access road on the southern embankment;
4. Unprotected Hyperflex© liner along the upstream slope on the eastern portion of the impoundment; and,
5. Sparse vegetation, rutting and wave action erosion of the downstream slope on the eastern embankment.

In general, the overall condition of the SP2 Impoundment was judged to be **FAIR**. The SP2 Impoundment was found to have the following deficiencies:

1. Trees present on the northeast portion of the downstream slope;
2. Eroded ditched near the northeast portion of the downstream slope;
3. Broad area of unprotected slope with generalized erosion on the downstream slope of the eastern embankment;
4. Rutting of the gravel access road on the crest of the eastern embankment;
5. Wave action erosion on the upstream slope near the southeastern corner of the impoundment;
6. Eroded ditch on the downstream slope near the southwest corner of the impoundment;
7. Sloughing on the downstream slope of the western embankment;
8. Erosion of the gravel shoulder of the crest access road on the western embankment;
9. Erosion of the gravel beneath the pipelines along the upper portion of the western embankment; and,
10. The toe of the northern portion of the western embankment has been excavated without an analysis of the impact to structural integrity and the surface was left unprotected. The western embankment is part of the Mississippi River levee system.

3.2 Studies and Analyses

The following recommendations and remedial measures generally describe the recommended approach to address current deficiencies at the impoundments. Prior to undertaking the recommended maintenance, repairs, or remedial measures, the applicability of environmental permits needs to be determined for activities that may occur within resource areas under the jurisdiction of the appropriate regulatory agencies.

GZA recommends that NMPP perform the following analysis and studies:

1. Confirm that the elevation of the SP2 Impoundment embankments meet the State of Missouri and the COE requirements for industrial impoundments within the Mississippi River flood plain.
2. Perform a hydraulic/hydrologic analysis of the impoundments including the adequacy of the impoundments to accommodate the PMP event required by the State of Missouri and the COE.



3. Perform a complete structural and seepage analysis of the impoundments that includes an analysis of the stability of the impoundments during the PMP and flooding of the Mississippi River. The analysis should also account for surcharge loads created by the stockpiling of ash near the impoundment embankments.
4. Evaluate the extent of wave action on the impoundment embankments and impacts on the stability of the slope; repair as necessary.
5. Based on its position as a downstream pond in the water treatment and discharge of ash products at the NMPP, it is likely that the Raw Water Pond contains ash products. GZA recommends the Raw Water Pond be included in future inspections and be subject to the operations and maintenance recommendations made herein.
6. Develop an EAP to reduce the potential for property damage, environmental damage, and/or loss of life in the areas affected by an impending dam break.
7. Evaluate the cause of sloughing on the western embankment of the AP1 Impoundment and SP2 Impoundment.
8. Evaluate the impact of toe removal on the stability of the western embankment of the SP2 Impoundment; repair if necessary.
9. Conduct video inspection of outlet pipes from decant structures.
10. Obtain complete copies of the impoundment design and construction documentation from the designing engineers.

3.3 Recurrent Operation & Maintenance Recommendations

GZA recommends the following operation and maintenance level activities:

1. Increased mowing of the grasses on the embankments currently vegetated with tall grasses. The COE recommends vegetation be kept to less than 12 inches in height on embankments to facilitate inspections and reduce the risk of burrowing animals¹⁷.
2. Routine measurements of the groundwater levels in the monitoring wells to evaluate changes in groundwater and seepage conditions.
3. Repair the erosion and grade the gravel access road on the southern embankment of the AP2 Impoundment to allow proper drainage.
4. Clear deep rooted vegetation from embankments, top of impoundments, and within 50 feet of the embankment toes as recommended by the COE.¹⁸
5. Topsoil and seed areas of poor vegetation in the AP1 Impoundment, AP2 Impoundment and SP2 Impoundment.
6. Provide protective cover over the HDPE liner in the AP2 Impoundment.

¹⁷ COE ETL 1110-2-571 "Guidelines For Landscape Planting And Vegetation Management At Levees, Floodwalls, Embankment Dams, And Appurtenant Structures", April 2009.

¹⁸ Ibid.

3.4 Repair Recommendations

GZA recommends the following minor repairs which may improve the overall condition of the impoundment, but do not alter the current design. The recommendations may require design by a professional engineer and construction contractor experienced in impoundment construction.



1. Repair sloughed soil on the western embankment of the AP1 Impoundment.
2. Repair areas of erosion on the AP1 Impoundment, SP1 Impoundment, AP2 Impoundment, and SP2 Impoundment.
3. Repair rutting present on the SP2 Impoundment crest access road.

3.5 Alternatives

There are no practical alternatives to the repairs itemized above.

4.0 ENGINEER'S CERTIFICATION

I acknowledge that the management unit referenced herein, the NMPP Ash Pond 1, Slag Pond 1, Ash Pond 2, and Slag Pond 2 Impoundments have been assessed to be in **FAIR** condition on October 6, 2010.

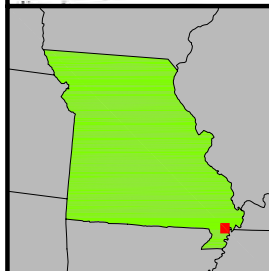
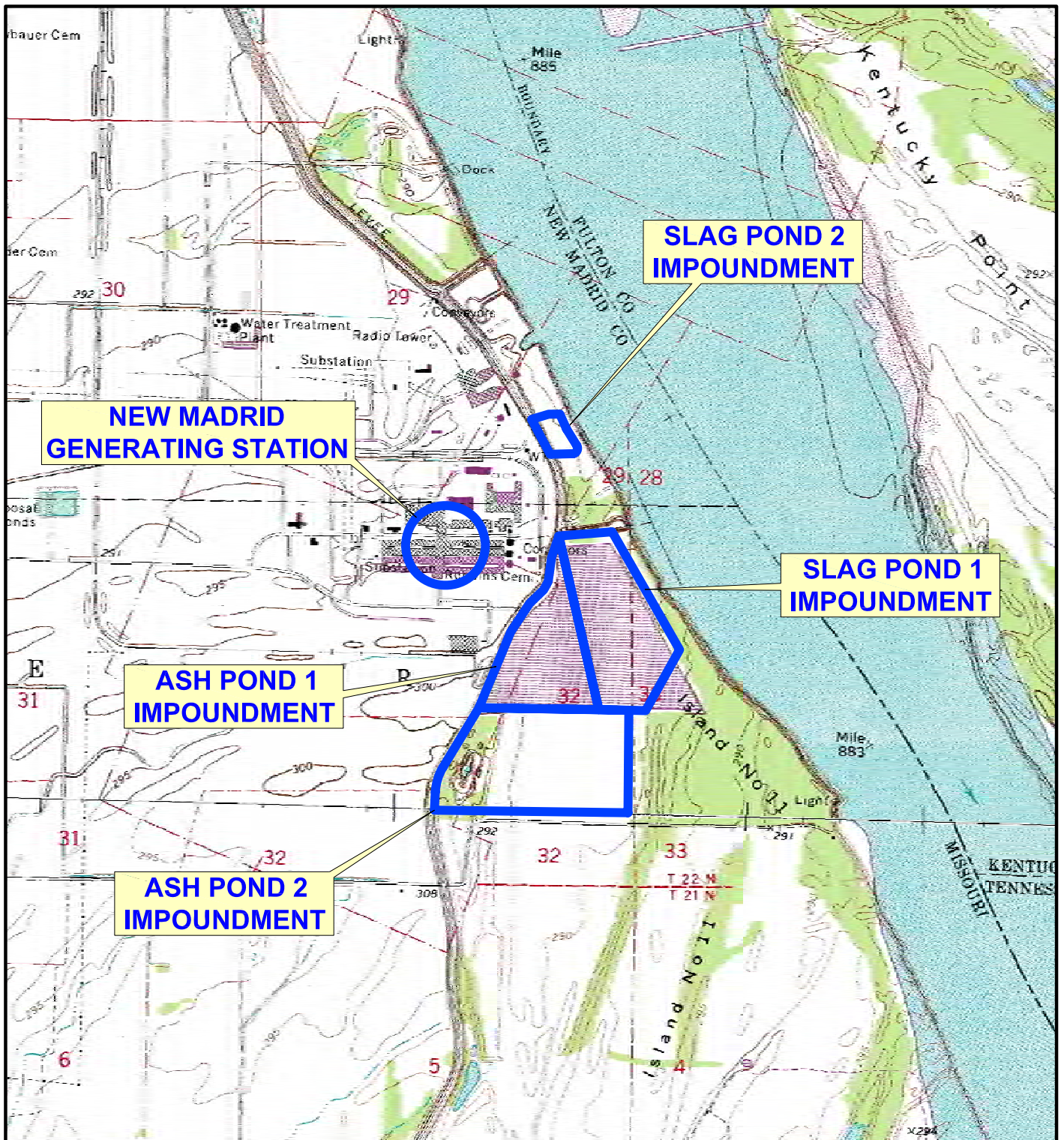
Patrick J. Harrison, P.E.
Senior Engineering Consultant

J:\01.xx Norwood\01.0170142.20 CCW Dams Round 7\Task 1 CLIN 004 AECl New Madrid MO\Draft Report\Revised NM Report-Reviewed.doc



Figures

GZA-1;GZA_USA#01.0170142.2 Ash ImpoundmentsNew Madrid, MO\DRAWINGS\AutoCAD\MATCHED - SITE LOCATION.dwg [FIGURE 1 - SITE LOCATION (4)] November 23, 2010 - 10:07am justin.hegarty



SOURCE:
USGS TOPOGRAPHIC QUADRANGLE MAPS:
NEW MADRID, KY-MO (1971 & 1982)
POINT PLEASANT, MO-TENN-KY (1971 & 1982)

Data Supplied by:



0 1,000' 2,000' 4,000'



PROJ. MGR.: DPS
DESIGNED BY: DPS
REVIEWED BY: DPS
OPERATOR: JAH

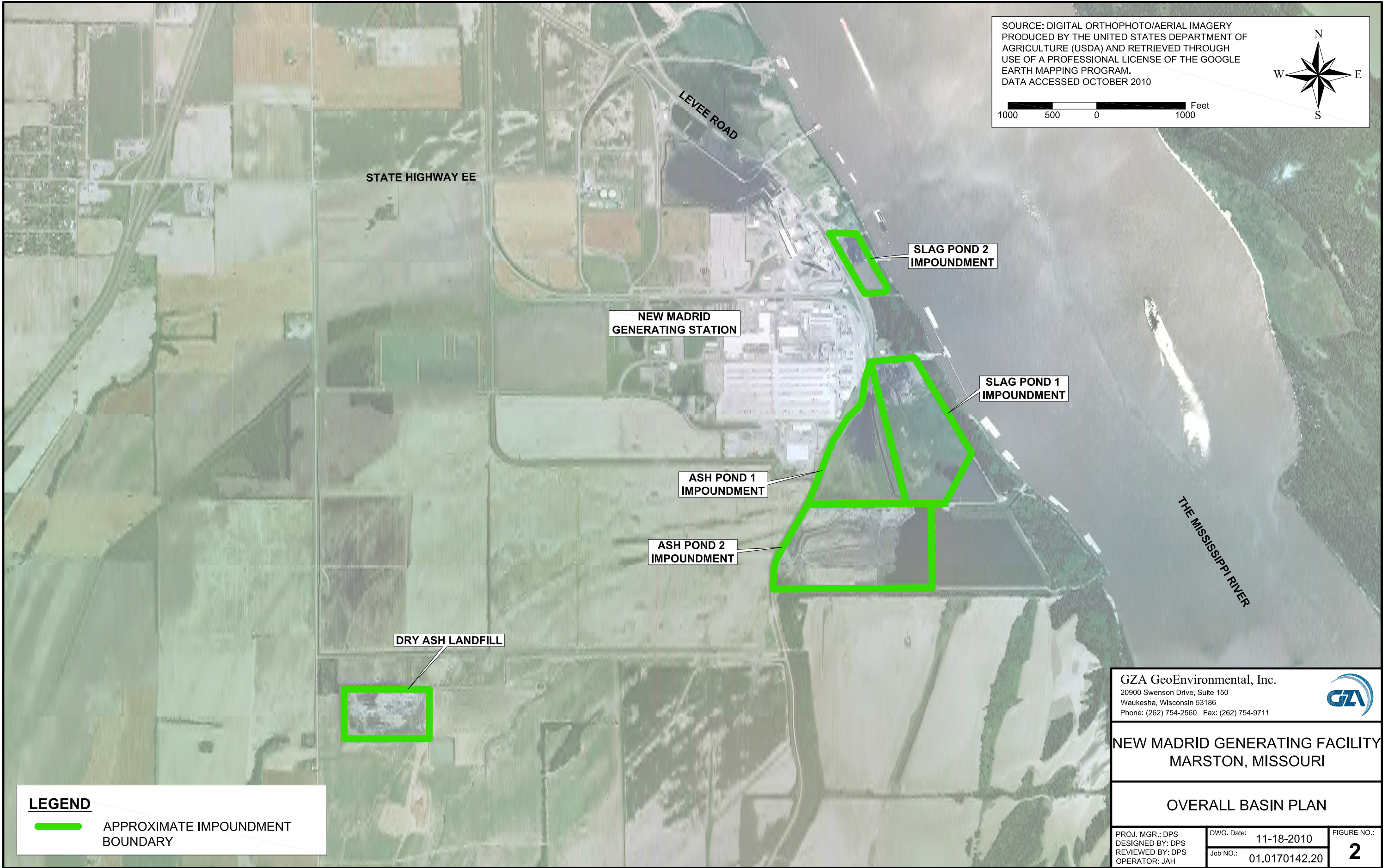
DATE: 11-1-2010

LOCUS PLAN
(USGS 7.5-MINUTE TOPOGRAPHIC QUAD)
NEW MADRID GENERATING STATION
MARSTON, MISSOURI


FIGURE NO.
01.0170142.20


FIGURE NO.
1

GZA-J:\GZA_USA\01.0170142.2 Ash Impoundments\New Madrid, MO\DRAWINGS\AutoCAD\MATCHED - SITE PLANS.dwg [LARGE] November 23, 2010 - 9:54am justin.hegarty

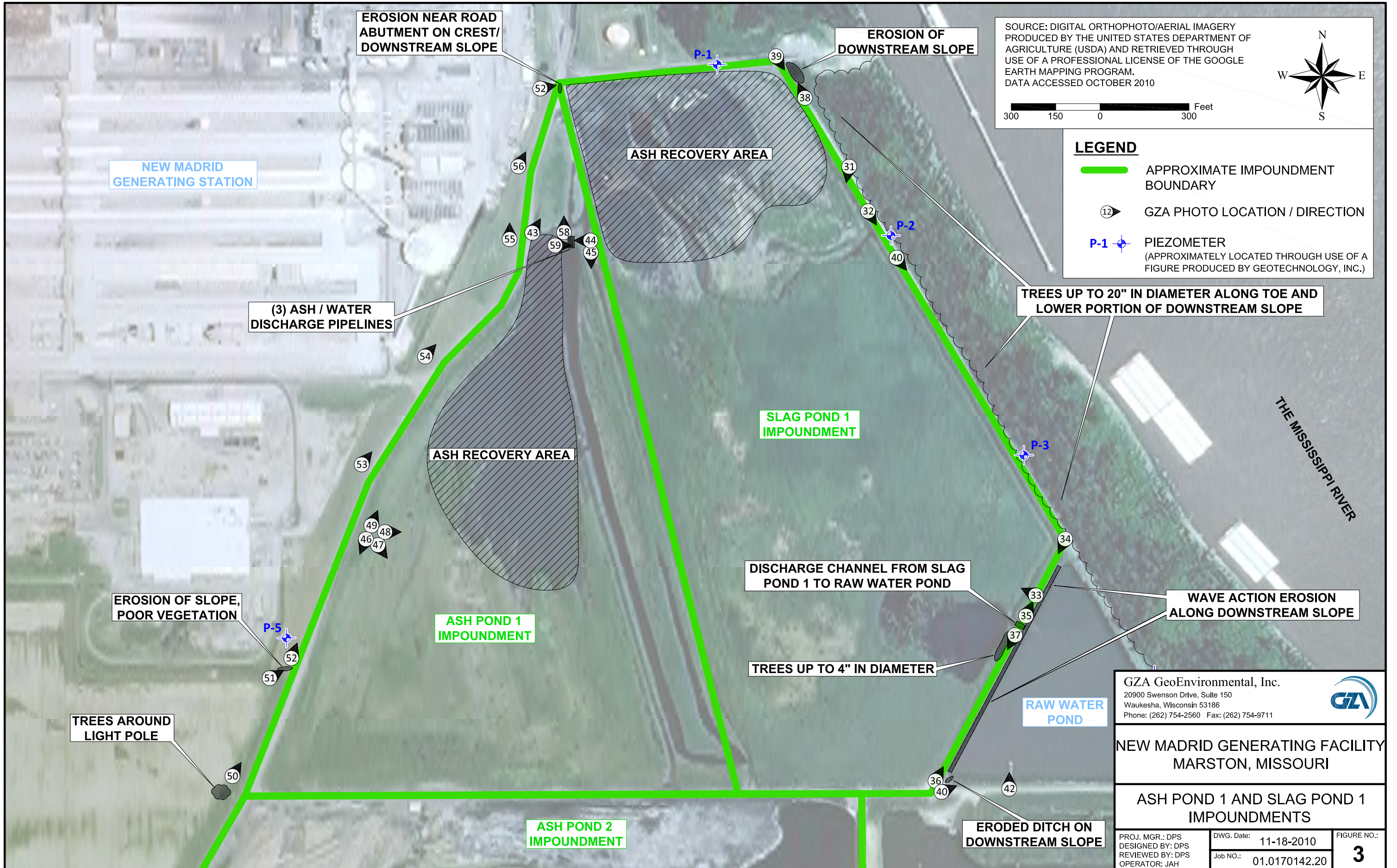


LEGEND

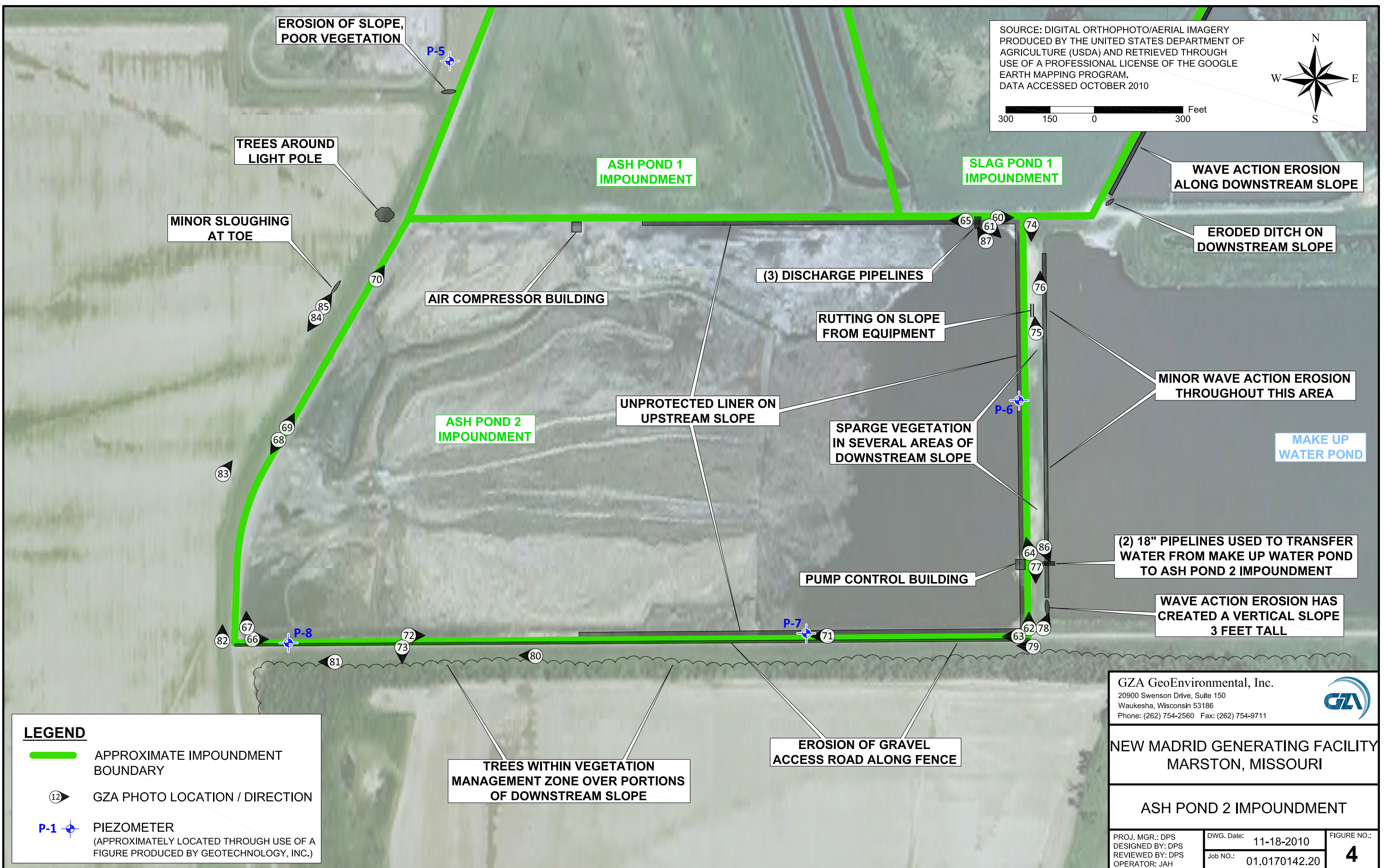
 APPROXIMATE IMPOUNDMENT BOUNDARY

GZA GeoEnvironmental, Inc. 20900 Swenson Drive, Suite 150 Waukesha, Wisconsin 53186 Phone: (262) 754-2560 Fax: (262) 754-9711		
NEW MADRID GENERATING FACILITY MARSTON, MISSOURI		
OVERALL BASIN PLAN		
PROJ. MGR.: DPS DESIGNED BY: DPS REVIEWED BY: DPS OPERATOR: JAH	DWG. Date: 11-18-2010 Job NO.: 01.0170142.20	FIGURE NO.: 2

GZA--J:\GZA_USA\01.0170142.2 Ash Impoundments\New Madrid, MO\DRAWINGS\AutoCAD\MATCHED - SITE PLANS.dwg [ASH 1 AND SLAG 1] January 17, 2011 - 8:26am justin.hegarty



GZA--J:\GZA_USA\01.0170142.2 Ash Impoundments\New Madrid, MO\DRAWINGS\AutoCAD\MATCHED - SITE PLANS.dwg [ASH 2] January 17, 2011 - 8:23am justin.hegarty



LEGEND

- APPROXIMATE IMPOUNDMENT BOUNDARY
- GZA PHOTO LOCATION / DIRECTION
- PIEZOMETER (APPROXIMATELY LOCATED THROUGH USE OF A FIGURE PRODUCED BY GEOTECHNOLOGY, INC.)

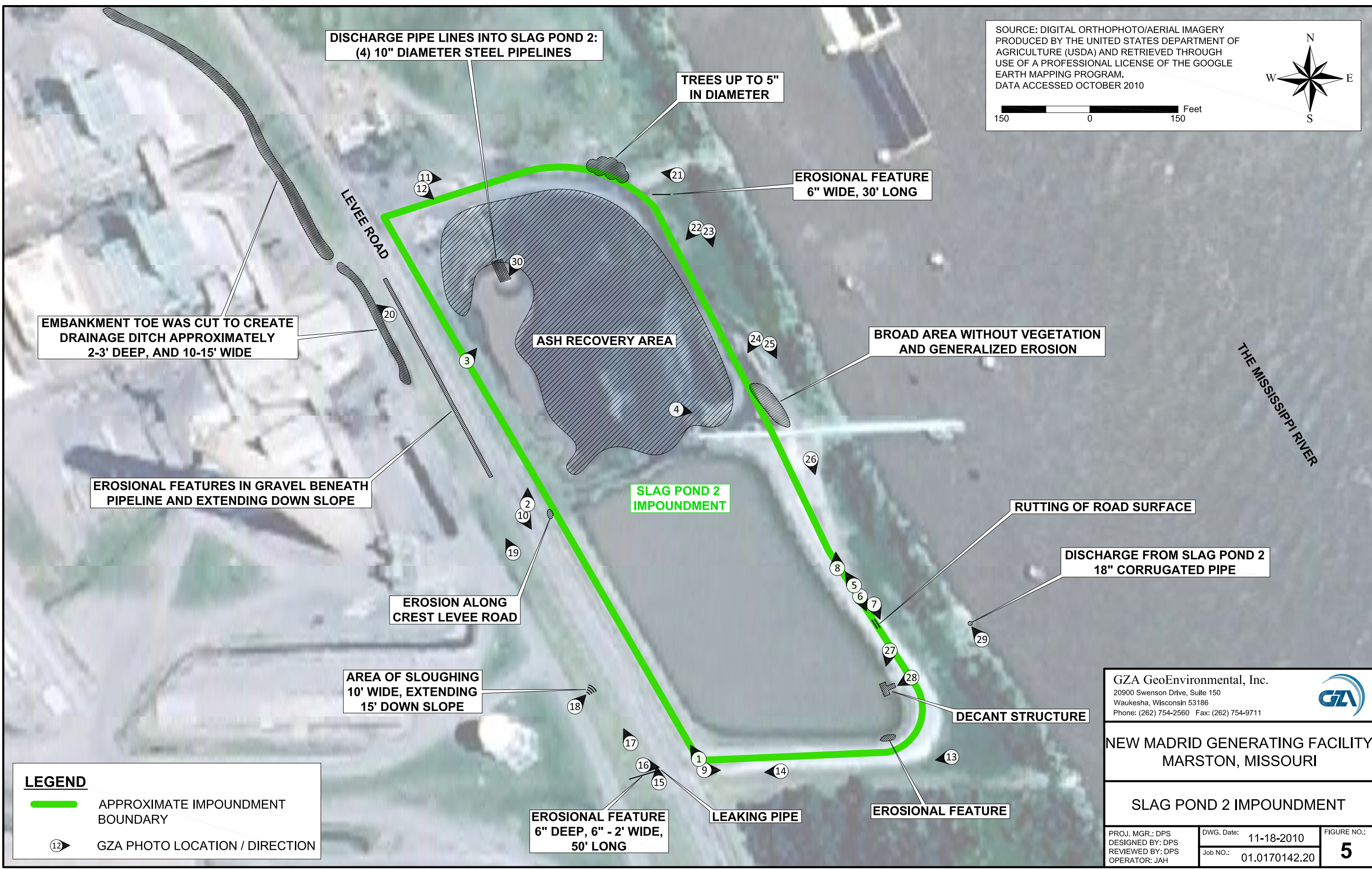
GZA GeoEnvironmental, Inc.
20900 Swenson Drive, Suite 150
Waukesha, Wisconsin 53186
Phone: (262) 754-2560 Fax: (262) 754-9711

NEW MADRID GENERATING FACILITY
MARSTON, MISSOURI

ASH POND 2 IMPOUNDMENT

PROJ. MGR.: DPS DESIGNED BY: DPS REVIEWED BY: DPS OPERATOR: JAH	DWG. Date: 11-18-2010 Job NO.: 01.0170142.20	FIGURE NO.: 4
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GZA-J:\GZA_USA\01.0170142.2 Ash Impoundments\New Madrid, MO\DRAWINGS\AutoCAD\MATCHED - SITE PLANS.dwg [SLAG 2] November 23, 2010 - 10:03am justin.hegarty





Appendix A

Limitations

DAM ENGINEERING & VISUAL INSPECTION LIMITATIONS

1. The observations described in this report were made under the conditions stated herein. The conclusions presented in the report were based solely on the services described therein, and not on scientific tasks or procedures beyond the scope of described services.
2. In preparing this report, GZA GeoEnvironmental, Inc. (GZA) has relied on certain information provided by Associated Electric Cooperative, Inc. ([AECI] and their affiliates) as well as federal, state, and local officials and other parties referenced therein. GZA has also relied on other parties which were available to GZA at the time of the inspection. Although there may have been some degree of overlap in the information provided by these various sources, GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this work.
3. In reviewing this Report, it should be noted that the reported condition of the dam is based on observations of field conditions during the course of this study along with data made available to GZA. The observations of conditions at the dam reflect only the situation present at the specific moment in time the observations were made, under the specific conditions present. It may be necessary to reevaluate the recommendations of this report when subsequent phases of evaluation or repair and improvement provide more data.
4. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions may be detected.
5. Water level readings have been reviewed and interpretations have been made in the text of this report. Fluctuations in the level of the groundwater and surface water may occur due to variations in rainfall, temperature, and other factors different than at the time measurements were made.
6. GZA's comments on the hydrology, hydraulics, and embankment stability for the dam are based on a limited review of available design documentation prepared by Burns and McDonnell for AECI. Calculations and computer modeling used by Burns and McDonnell in these analyses were not available and were not independently reviewed by GZA.
7. This report has been prepared for the exclusive use of US EPA for specific application to the existing dam facilities, in accordance with generally accepted dam engineering practices. No other warranty, express or implied, is made.
8. This dam inspection verification report has been prepared for this project by GZA. This report is for broad evaluation and management purposes only and is not sufficient, in and of itself, to prepare construction documents or an accurate bid.



Appendix B

Definitions

COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions refer to references published by the U.S. Army Corps of Engineers, the Federal Energy Regulatory Commission, the Department of the Interior Bureau of Reclamation, or the Federal Emergency Management Agency.

Orientation

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

Dam Components

Dam – Shall mean any artificial barrier, including appurtenant works, which impounds or diverts water.

Embankment – Shall mean the fill material, usually earth or rock, placed with sloping sides, such that it forms a permanent barrier that impounds water.

Crest – Shall mean the top of the dam, usually provides a road or path across the dam.

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – Shall mean structures, either in dams or separate there from, including but not be limited to, spillways; reservoirs and their rims; low level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway – Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

General

EAP – Emergency Action Plan - Shall mean a predetermined plan of action to be taken to reduce the potential for property damage and/or loss of life in an area affected by an impending dam break.

O&M Manual – Operations and Maintenance Manual; Document identifying routine maintenance and operational procedures under normal and storm conditions.

Normal Pool – Shall mean the elevation of the impoundment during normal operating conditions.

Acre-foot – Shall mean a unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. One million U.S. gallons = 3.068 acre feet.

Height of Dam – Shall mean the vertical distance from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the crest of the dam.

Spillway Design Flood (SDF) – Shall mean the flood used in the design of a dam and its appurtenant works particularly for sizing the spillway and outlet works, and for determining maximum temporary storage and height of dam requirements.

Condition Rating

SATISFACTORY - No existing or potential management unit safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) in accordance with the applicable criteria. Minor maintenance items may be required.

FAIR - Acceptable performance is expected under all required loading conditions (static, hydrologic, seismic) in accordance with the applicable safety regulatory criteria. Minor deficiencies may exist that require remedial action and/or secondary studies or investigations.

POOR - A management unit safety deficiency is recognized for any required loading condition (static, hydrologic, seismic) in accordance with the applicable dam safety regulatory criteria. Remedial action is necessary. POOR also applies when further critical studies or investigations are needed to identify any potential dam safety deficiencies.

UNSATISFACTORY - Considered unsafe. A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution. Reservoir restrictions may be necessary.

Hazard Potential

(In the event the impoundment should fail, the following would occur):

LESS THAN LOW HAZARD POTENTIAL: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

LOW HAZARD POTENTIAL: Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

SIGNIFICANT HAZARD POTENTIAL: Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

HIGH HAZARD POTENTIAL: Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.



Appendix C

Inspection Checklists



Site Name:	New Madrid Power Plant	Date:	10/6/10
Unit Name:	Ash Pond 1	Operator's Name:	Associated Electric Cooperative, Inc.
Unit I.D.:	Hazard Potential Classification: High Significant Low		
Inspector's Name: Patrick J. Harrison, P.E.; Doug P. Simon			

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

		Yes	No			Yes	No
1. Frequency of Company's Dam Inspections?	Daily/Semi-Annual			18. Sloughing or bulging on slopes?		X	
2. Pool elevation (operator records)?	303 MSL			19. Major erosion or slope deterioration?			X
3. Decant inlet elevation (operator records)?	NA			20. Decant Pipes:			
4. Open channel spillway elevation (operator records)?	X			Is water entering inlet, but not exiting outlet?		NA	
5. Lowest dam crest elevation (operator records)?	310 MSL			Is water exiting outlet, but not entering inlet?		NA	
6. If instrumentation is present, are readings recorded (operator records)?	X			Is water exiting outlet flowing clear?		NA	
7. Is the embankment currently under construction?		X		21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):			
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	X			From underdrain?			X
9. Trees growing on embankment? (If so, indicate largest diameter below)	X			At isolated points on embankment slopes?			X
10. Cracks or scarps on crest?		X		At natural hillside in the embankment area?			X
11. Is there significant settlement along the crest?		X		Over widespread areas?			X
12. Are decant trashracks clear and in place?	NA			From downstream foundation area?			X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X		"Boils" beneath stream or ponded water?			X
14. Clogged spillways, groin or diversion ditches?		X		Around the outside of the decant pipe?			X
15. Are spillway or ditch linings deteriorated?		X		22. Surface movements in valley bottom or on hillside?			X
16. Are outlets of decant or underdrains blocked?	NA			23. Water against downstream toe?			X
17. Cracks or scarps on slopes?		X		24. Were Photos taken during the dam inspection?		X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue #	Comments
1. Inspections are performed and documented on semi-annual basis by plant personnel. Daily inspections currently performed by plant personnel, but not documented.	
9. Trees up to 4 inches in diameter located near power poles along west embankment.	
18. Minor sloughing and small erosion on west side near corner of fence.	
20. Water discharges from pond via ditch into Slag Pond 1.	



**Coal Combustion Waste (CCW)
Impoundment Inspection**

Impoundment NPDES Permit # MO-0001171
Date 10/6/10

Doug Simon
INSPECTOR Patrick J. Harrison, P.E.

Impoundment Name Ash Pond 1
Impoundment Company Associated Electric Corporation, Inc.
EPA Region Region VII
State Agency (Field Office) Addresss MO-DNR - 2155 North Westwood Boulevard
Poplar Bluff, MO 63901

Name of Impoundment Ash Pond 1
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _____ Update x

Is impoundment currently under construction?
Is water or ccw currently being pumped into the impoundment?

Yes	No
_____	<u>x</u>
<u>x</u>	_____

IMPOUNDMENT FUNCTION: Receives economizer ash, fines from runoff, and high temperature ash. Ash is separated for reuse and water is discharged from Ash Pond 1 to Slag Pond 1.

Nearest Downstream Town : Name Caruthersville
Distance from the impoundment 22 miles measured in straightline on GoogleEarth
Impoundment
Location: Longitude 36 Degrees 30 Minutes 22 Seconds
Latitude 89 Degrees 33 Minutes 86 Seconds
State MO County New Madrid

Does a state agency regulate this impoundment? YES x NO _____

If So Which State Agency? Missouri Department of Natural Resources, Solid Waste Division

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

_____ ^x **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

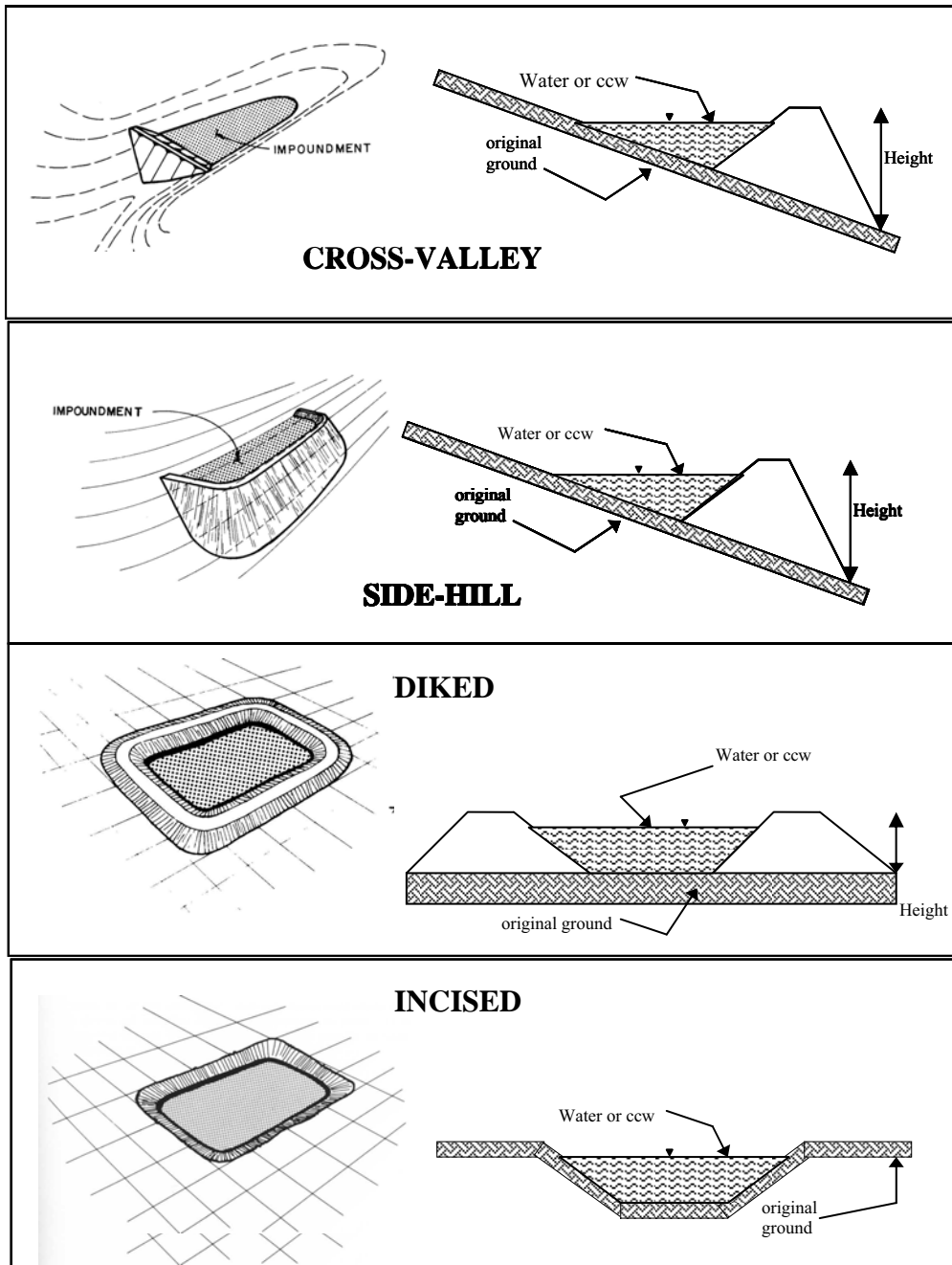
_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Water and ash are sluiced into ditch that is located in center of impoundment approximately
100 feet from embankment. Ash is recovered from ditch and stockpiled in areas of the impoundment.

Failure would not likely result in loss of human life and have low economic/environmental losses
limited to owner's property.

CONFIGURATION:



- ☐ Cross-Valley
☐ Side-Hill
☐ Diked
☐ Incised (form completion optional)
☒ Combination Incised/Diked

Embankment Height 12 feet Embankment Material Silty Clay
 Pool Area 31 acres Liner None Observed or Reported
 Current Freeboard 7 feet Liner Permeability NA

TYPE OF OUTLET (Mark all that apply)

_____ **Open Channel Spillway**

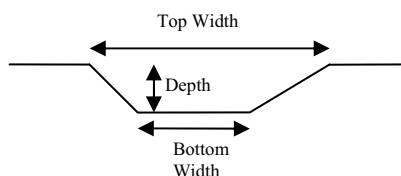
_____ Trapezoidal

_____ Triangular

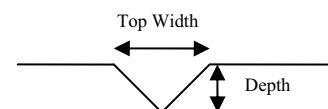
_____ Rectangular

 X Irregular

TRAPEZOIDAL



TRIANGULAR



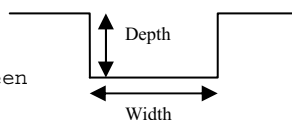
Unknown depth

Unknown bottom (or average) width

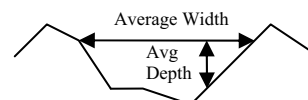
 15' top width

_____ Cut ditch through embankment between
Ash Pond 1 and Slag Pond 1

RECTANGULAR



IRREGULAR



_____ **Outlet**

_____ inside diameter

Material

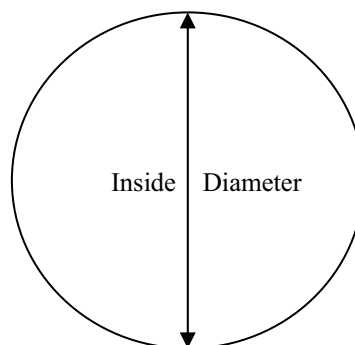
_____ corrugated metal

_____ welded steel

_____ concrete

_____ plastic (hdpe, pvc, etc.)

_____ other (specify) _____



Is water flowing through the outlet? YES _____ NO _____

_____ **No Outlet**

_____ **Other Type of Outlet (specify)** _____

The Impoundment was Designed By Burns & McDonnell

YES NO x

[illegible]



Site Name:	New Madrid Power Plant	Date:	10/6/10
Unit Name:	Ash Pond 2	Operator's Name:	Associated Electric Cooperative, Inc.
Unit I.D.:	Hazard Potential Classification: High Significant Low		
Inspector's Name: Patrick J. Harrison, P.E.; Doug P. Simon			

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

		Yes	No			Yes	No
1. Frequency of Company's Dam Inspections?	Daily / Semi-Annual			18. Sloughing or bulging on slopes?			X
2. Pool elevation (operator records)?	300 MSL			19. Major erosion or slope deterioration?	X		
3. Decant inlet elevation (operator records)?	NA			20. Decant Pipes:			
4. Open channel spillway elevation (operator records)?	NA			Is water entering inlet, but not exiting outlet?	NA		
5. Lowest dam crest elevation (operator records)?	307 MSL			Is water exiting outlet, but not entering inlet?	NA		
6. If instrumentation is present, are readings recorded (operator records)?	X			Is water exiting outlet flowing clear?	NA		
7. Is the embankment currently under construction?		X		21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):			
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	X			From underdrain?			X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X		At isolated points on embankment slopes?			X
10. Cracks or scarps on crest?		X		At natural hillside in the embankment area?			X
11. Is there significant settlement along the crest?		X		Over widespread areas?			X
12. Are decant trashracks clear and in place?	NA			From downstream foundation area?			X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X		"Boils" beneath stream or ponded water?			X
14. Clogged spillways, groin or diversion ditches?		X		Around the outside of the decant pipe?			X
15. Are spillway or ditch linings deteriorated?		X		22. Surface movements in valley bottom or on hillside?			X
16. Are outlets of decant or underdrains blocked?		X		23. Water against downstream toe?	X		
17. Cracks or scarps on slopes?		X		24. Were Photos taken during the dam inspection?	X		

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue #	Comments
1.	Inspections are performed and documented on semi-annual basis by plant personnel. Daily inspections currently performed by plant personnel, but not documented.
2.	The water levels in Ash Pond 2 are not measured or recorded by the plant personnel.
6.	Piezometers located on the embankment.
19., 23.	Raw Water Pond adjacent to impoundment on east. Wave action in Raw Water Pond has caused beaching/erosion at water line.
20.	Impoundment currently inactive.



**Coal Combustion Waste (CCW)
Impoundment Inspection**

Impoundment NPDES Permit # MO-0001171
Date 10/6/10

Doug Simon
INSPECTOR Patrick J. Harrison, P.E.

Impoundment Name Ash Pond 2
Impoundment Company Associated Electric Corporation, Inc.
EPA Region Region VII
State Agency (Field Office) Addresss MO-DNR - 2155 North Westwood Boulevard
Poplar Bluff, MO 63901

Name of Impoundment Ash Pond 2
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _____ Update x

Is impoundment currently under construction?
Is water or ccw currently being pumped into the impoundment?

Yes	No
_____	<u>x</u>
<u>x</u>	_____

IMPOUNDMENT FUNCTION: Receives fly ash, used as backup if pug mill goes down.

Nearest Downstream Town : Name Caruthersville
Distance from the impoundment 22 miles measured in straightline on GoogleEarth
Impoundment
Location: Longitude 36 Degrees 30 Minutes 06 Seconds
Latitude 89 Degrees 33 Minutes 27 Seconds
State MO County New Madrid

Does a state agency regulate this impoundment? YES x NO _____

If So Which State Agency? Missouri Department of Natural Resources, Solid Waste Division

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

 LESS THAN LOW HAZARD POTENTIAL: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

x **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

SIGNIFICANT HAZARD POTENTIAL: Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

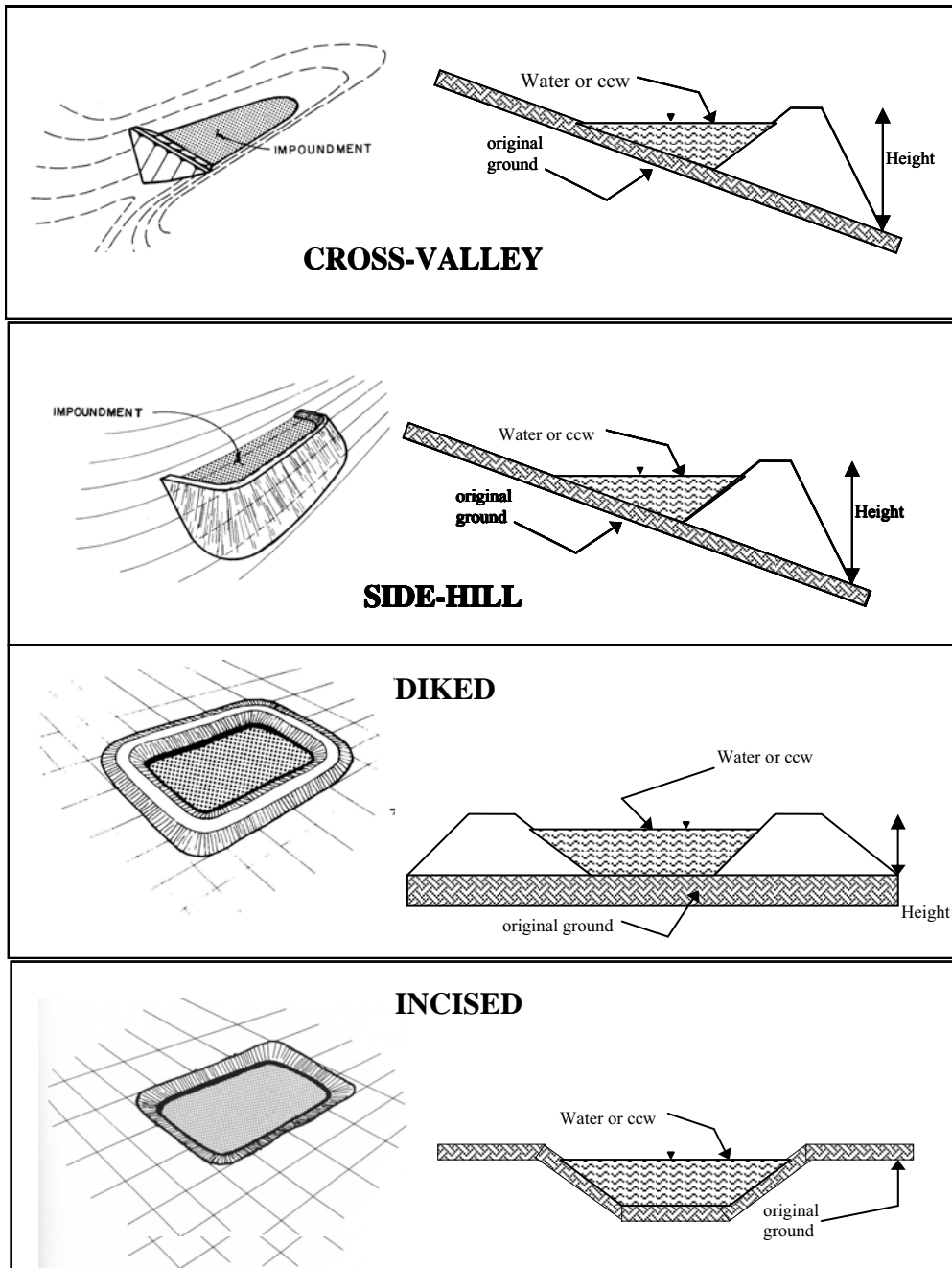
HIGH HAZARD POTENTIAL: Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Failure of the impoundment is not likely to result in loss of human life. Economic/environmental losses would be limited.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

CONFIGURATION:



☐ Cross-Valley
☐ Side-Hill
☒ Diked
☐ Incised (form completion optional)
☐ Combination Incised/Diked

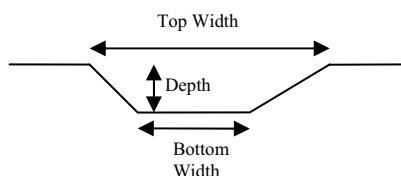
Embankment Height 20 feet Embankment Material Silty Clay
 Pool Area 78 acres Liner 80 & 60 mil HDPE
 Current Freeboard 7 feet Liner Permeability <10⁻¹⁰ cm/sec

TYPE OF OUTLET (Mark all that apply)

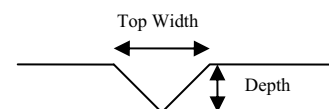
Open Channel Spillway

- ☐ Trapezoidal
☐ Triangular
☐ Rectangular
☐ Irregular

TRAPEZOIDAL

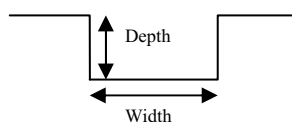


TRIANGULAR

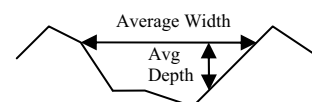


- ☐ depth
☐ bottom (or average) width
☐ top width

RECTANGULAR



IRREGULAR

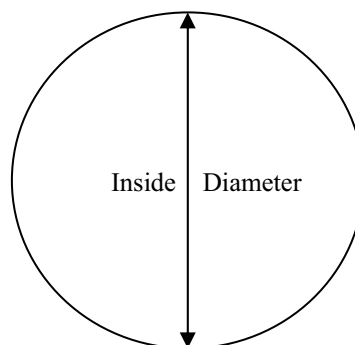


Outlet

- ☐ inside diameter

Material

- ☐ corrugated metal
☐ welded steel
☐ concrete
☐ plastic (hdpe, pvc, etc.)
☐ other (specify) _____



Is water flowing through the outlet? YES _____ NO ☒ _____ Impoundment currently inactive.

No Outlet

☒ **Other Type of Outlet (specify)** Decant Pump House

The Impoundment was Designed By Burns & McDonnell

YES NO x

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



Site Name:	New Madrid Power Plant	Date:	10/6/10
Unit Name:	Slag Pond 1	Operator's Name:	Associated Electric Cooperative, Inc.
Unit I.D.:		Hazard Potential Classification:	High Significant Low
Inspector's Name: Patrick J. Harrison, P.E.; Doug P. Simon			

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

		Yes	No			Yes	No
1. Frequency of Company's Dam Inspections? <u>Daily</u> /Semi-Annual				18. Sloughing or bulging on slopes?		X	
2. Pool elevation (operator records)?		No		19. Major erosion or slope deterioration?			X
3. Decant inlet elevation (operator records)?		NA		20. Decant Pipes:			
4. Open channel spillway elevation (operator records)?		No		Is water entering inlet, but not exiting outlet?		NA	
5. Lowest dam crest elevation (operator records)?		3 0 7 MSL		Is water exiting outlet, but not entering inlet?		NA	
6. If instrumentation is present, are readings recorded (operator records)?		X		Is water exiting outlet flowing clear?		NA	
7. Is the embankment currently under construction?			X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):			
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?		X		From underdrain?			X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X		At isolated points on embankment slopes?			X
10. Cracks or scarps on crest?			X	At natural hillside in the embankment area?			
11. Is there significant settlement along the crest?			X	Over widespread areas?			X
12. Are decant trashracks clear and in place?		NA		From downstream foundation area?			X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?			X	"Boils" beneath stream or ponded water?			X
14. Clogged spillways, groin or diversion ditches?			X	Around the outside of the decant pipe?		NA	
15. Are spillway or ditch linings deteriorated?			X	22. Surface movements in valley bottom or on hillside?			X
16. Are outlets of decant or underdrains blocked?		NA		23. Water against downstream toe?		X	
17. Cracks or scarps on slopes?			X	24. Were Photos taken during the dam inspection?		X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

<u>Inspection Issue #</u>	<u>Comments</u>
1.	Inspections are performed and documented on semi-annual basis by plant personnel. Daily inspections currently performed by plant personnel, but not documented.
2,4.	Water levels are not measured, but are controlled by water levels in Raw Water Pond.
6.	Water levels measured in piezometers.
9.	Trees up to 18 inches in diameter growing on toe of east slope.
18.	Minor sloughing and erosion along upstream side of east embankment.
23.	Raw Water Pond is adjacent to the south and water is maintained in pond.



**Coal Combustion Waste (CCW)
Impoundment Inspection**

Impoundment NPDES Permit # MO-0001171
Date 10/6/10

Doug Simon
INSPECTOR Patrick J. Harrison, P.E.

Impoundment Name Slag Pond 1
Impoundment Company Associated Electric Corporation, Inc.
EPA Region Region VII
State Agency (Field Office) Addresss MO-DNR - 2155 North Westwood Boulevard
Poplar Bluff, MO 63901

Name of Impoundment Slag Pond 1
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _____ Update x

Is impoundment currently under construction?
Is water or ccw currently being pumped into the impoundment?

Yes	No
<u> </u>	<u>x</u>
<u>x</u>	<u> </u>

IMPOUNDMENT FUNCTION: Sluicing of slag. Slag is removed and water is discharged to raw water pond for discharge.

Nearest Downstream Town : Name Caruthersville
Distance from the impoundment 22 miles measured in straightline on GoogleEarth
Impoundment
Location: Longitude 36 Degrees 30 Minutes 27 Seconds
Latitude 89 Degrees 33 Minutes 24 Seconds
State MO County New Madrid

Does a state agency regulate this impoundment? YES x NO _____

If So Which State Agency? Missouri Department of Natural Resources, Solid Waste Division

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

 LESS THAN LOW HAZARD POTENTIAL: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

_____ LOW HAZARD POTENTIAL: Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

SIGNIFICANT HAZARD POTENTIAL: Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

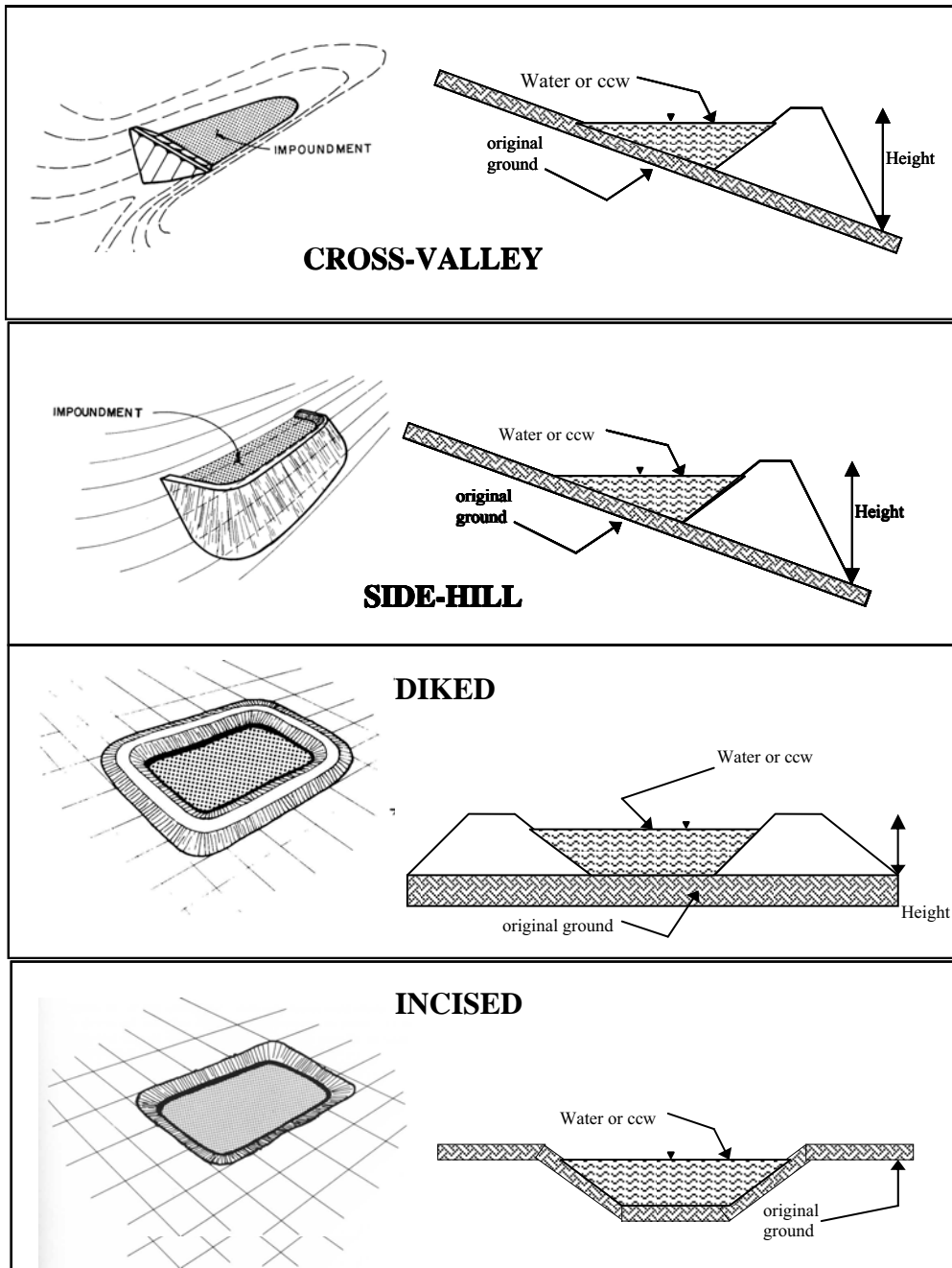
HIGH HAZARD POTENTIAL: Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Failure of the impoundment results in no probable loss of human life but could result in discharge of CCW into the Mississippi River and can cause environmental damage.

[illegible]

CONFIGURATION:



- ☐ Cross-Valley
☐ Side-Hill
☐ Diked
☐ Incised (form completion optional)
☒ Combination Incised/Diked

Embankment Height 20 feet Embankment Material Silty Clay
 Pool Area 62 acres Liner None Observed or Reported
 Current Freeboard 7 feet Liner Permeability NA

TYPE OF OUTLET (Mark all that apply)

_____ **Open Channel Spillway**

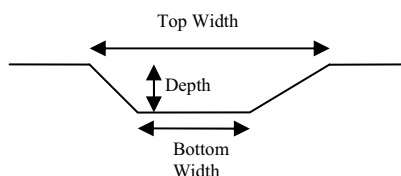
_____ Trapezoidal

_____ Triangular

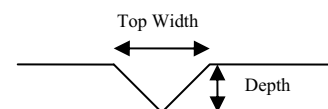
_____ Rectangular

 X Irregular

TRAPEZOIDAL



TRIANGULAR

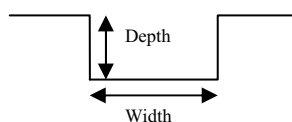


Unknown depth

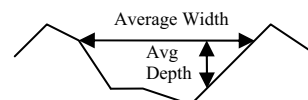
Unknown bottom (or average) width

Unknown top width

RECTANGULAR



IRREGULAR



Open ditch through embankment between
Slag Pond 1 and Raw Water Pond.

_____ **Outlet**

_____ inside diameter

Material

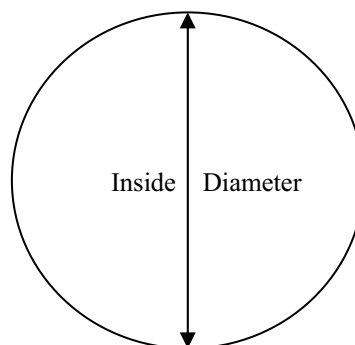
_____ corrugated metal

_____ welded steel

_____ concrete

_____ plastic (hdpe, pvc, etc.)

_____ other (specify) _____



Is water flowing through the outlet? YES _____ NO _____

_____ **No Outlet**

_____ **Other Type of Outlet (specify)** _____

The Impoundment was Designed By Burns & McDonnell

YES NO x

This image shows a full page of blank white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for writing or drawing. There are no margins, text, or other markings on the paper.



Site Name:	New Madrid Power Plant	Date:	10/6/10
Unit Name:	Slag Pond 2	Operator's Name:	Associated Electric Cooperative, Inc.
Unit I.D.:	Hazard Potential Classification: High Significant Low		
Inspector's Name: Patrick J. Harrison, P.E.; Doug P. Simon			

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

			Yes	No				Yes	No
1. Frequency of Company's Dam Inspections?	Daily	Semi-Annual			18. Sloughing or bulging on slopes?		X		
2. Pool elevation (operator records)?		299 MSL			19. Major erosion or slope deterioration?				X
3. Decant inlet elevation (operator records)?		299 MSL			20. Decant Pipes:				
4. Open channel spillway elevation (operator records)?		NA			Is water entering inlet, but not exiting outlet?				X
5. Lowest dam crest elevation (operator records)?		302 MSL			Is water exiting outlet, but not entering inlet?				X
6. If instrumentation is present, are readings recorded (operator records)?		NA			Is water exiting outlet flowing clear?		X		
7. Is the embankment currently under construction?			X		21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):				
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?		X			From underdrain?				X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X			At isolated points on embankment slopes?				X
10. Cracks or scarps on crest?			X		At natural hillside in the embankment area?				X
11. Is there significant settlement along the crest?			X		Over widespread areas?				X
12. Are decant trashracks clear and in place?			X		From downstream foundation area?				X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?			X		"Boils" beneath stream or ponded water?				X
14. Clogged spillways, groin or diversion ditches?			X		Around the outside of the decant pipe?				X
15. Are spillway or ditch linings deteriorated?			X		22. Surface movements in valley bottom or on hillside?				X
16. Are outlets of decant or underdrains blocked?			X		23. Water against downstream toe?				X
17. Cracks or scarps on slopes?			X		24. Were Photos taken during the dam inspection?		X		

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue #	Comments
1.	Inspections are performed and documented on semi-annual basis by plant personnel. Daily inspections currently performed by plant personnel, but not documented.
6.	No instrumentation present.
9.	Trees up to 4 inches in diameter on downslope of north embankment.
11.	Rutting in the roadway on east embankment.
12.	No trash racks present.
18.	Minor erosion and sloughing in several locations of downstream slopes.

**Coal Combustion Waste (CCW)
Impoundment Inspection**Impoundment NPDES Permit # MO-0001171
Date 10/6/10Doug Simon
INSPECTOR Patrick J. Harrison, P.E.Impoundment Name Slag Pond 2
Impoundment Company Associated Electric Corporation, Inc.
EPA Region Region VII
State Agency (Field Office) Addresss MO-DNR - 2155 North Westwood Boulevard
Poplar Bluff, MO 63901Name of Impoundment Slag Pond 2
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)New _____ Update xIs impoundment currently under construction?
Is water or ccw currently being pumped into the impoundment?

Yes	No
_____	<u>x</u>
<u>x</u>	_____

IMPOUNDMENT FUNCTION: Functions as a back up to Slag Pond 1 for Sluicing of Slag.Nearest Downstream Town : Name Caruthersville
Distance from the impoundment 22 miles measured in straightline on GoogleEarth
Impoundment
Location: Longitude 36 Degrees 30 Minutes 52 Seconds
Latitude 89 Degrees 33 Minutes 34 Seconds
State MO County New MadridDoes a state agency regulate this impoundment? YES x NO _____If So Which State Agency? Missouri Department of Natural Resources, Solid Waste Division

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

 LESS THAN LOW HAZARD POTENTIAL: Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

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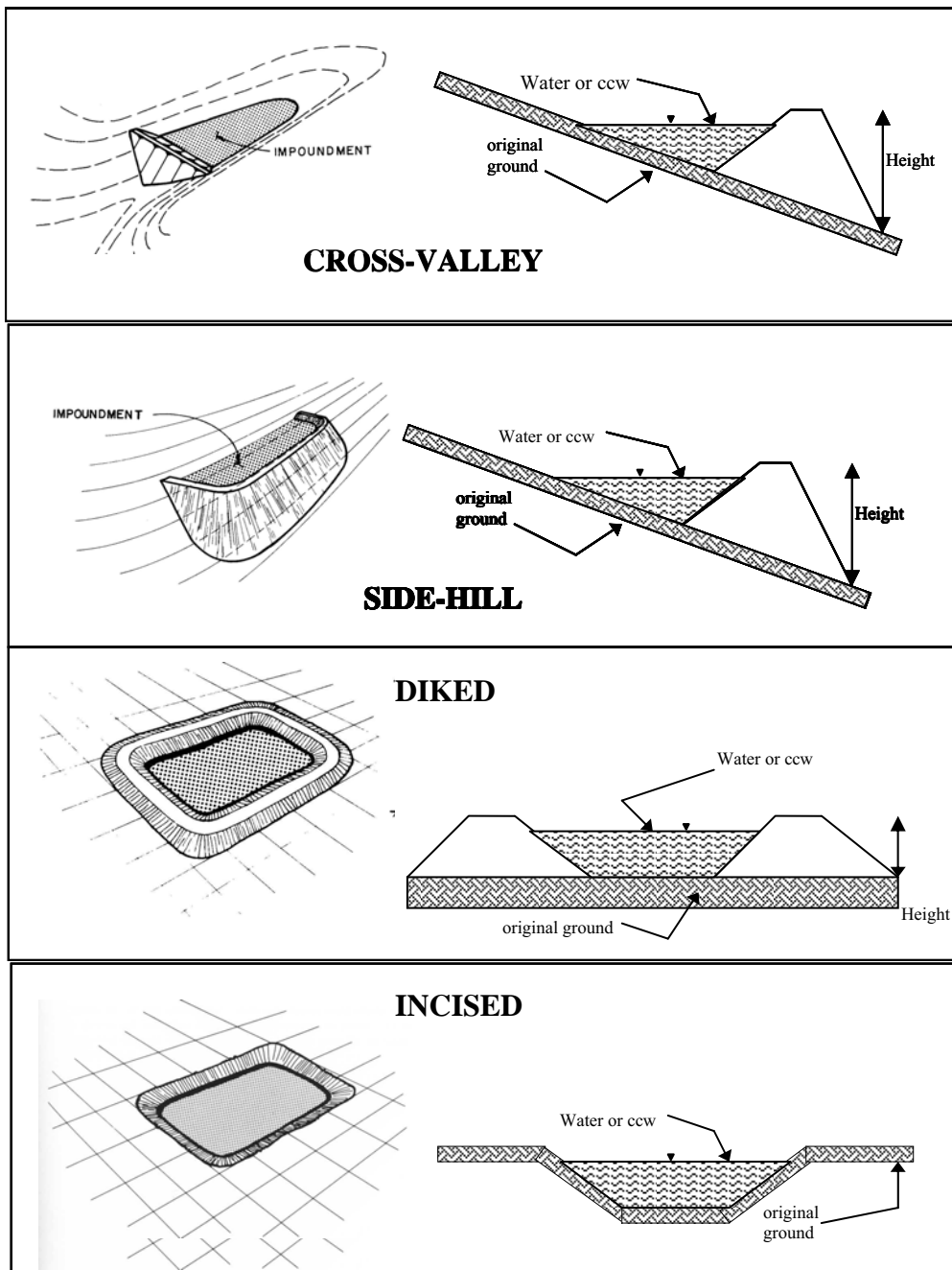
HIGH HAZARD POTENTIAL: Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Failure of the impoundment results in no probable loss of human life but could result in discharge of CCW into the Mississippi River and can cause environmental damage.

[illegible]

CONFIGURATION:



- ☐ Cross-Valley
- ☐ Side-Hill
- ☐ Diked
- ☐ Incised (form completion optional)
- ☒ Combination Incised/Diked

Embankment Height 20 feet Embankment Material Silty Clay
 Pool Area 4 acres Liner None Observed or Reported
 Current Freeboard 3 feet Liner Permeability NA

TYPE OF OUTLET (Mark all that apply)

 Open Channel Spillway

 Trapezoidal

 Triangular

 Rectangular

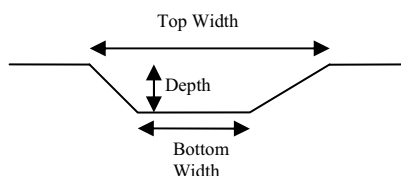
 Irregular

 depth

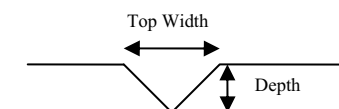
 bottom (or average) width

 top width

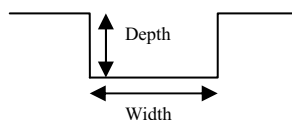
TRAPEZOIDAL



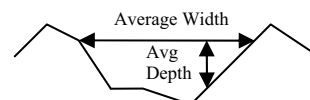
TRIANGULAR



RECTANGULAR



IRREGULAR



 x **Outlet**

 18" inside diameter

Material

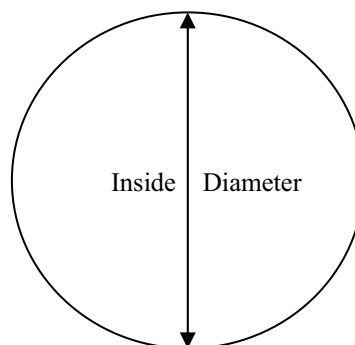
 x corrugated metal

 welded steel

 concrete

 plastic (hdpe, pvc, etc.)

 other (specify) _____



Is water flowing through the outlet? YES x NO

 No Outlet

 Other Type of Outlet (specify) _____

The Impoundment was Designed By Burns & McDonnell

YES _____ NO x

This image shows a full page of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for handwriting practice or general writing. There are no margins, text, or other markings on the page.

DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM:	<u>Ash Pond 1</u>	STATE ID #:	<u>MO-0001171</u>
REGISTERED:	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	NID ID #:	<u> </u>
STATE SIZE CLASSIFICATION:	<u> </u>	STATE HAZARD CLASSIFICATION:	<u>Environmental Class III (low)</u>
		CHANGE IN HAZARD CLASSIFICATION REQUESTED?:	<u> </u>
<u><i>DAM LOCATION INFORMATION</i></u>			
CITY/TOWN:	<u>Marston</u>	COUNTY:	<u>New Madrid, Missouri</u>
DAM LOCATION: (street address if known)	<u>41 Saint Jude Park, Marston, Missouri</u>	ALTERNATE DAM NAME:	<u>N/A</u>
USGS QUAD.:	<u>New Madrid and Point Pleasant, MO (1971 & 1982)</u>	LAT.:	<u>89 33' 86"</u>
		LONG.:	<u>36 30' 22"</u>
DRAINAGE BASIN:	<u> </u>	RIVER:	<u>The Mississippi River</u>
IMPOUNDMENT NAME(S):	<u>Ash Pond 1</u>		
<u><i>GENERAL DAM INFORMATION</i></u>			
TYPE OF DAM:	<u>Incised and bermed Ash Impoundments</u>	OVERALL LENGTH (FT):	<u>6,400</u>
PURPOSE OF DAM:	<u>Ash Impoundment</u>	NORMAL POOL STORAGE (ACRE-FT):	<u> </u>
			(Estimated)
YEAR BUILT:	<u>1970's</u>	MAXIMUM POOL STORAGE (ACRE-FT):	<u>570</u>
STRUCTURAL HEIGHT (FT):	<u>12</u>	EL. NORMAL POOL (FT):	<u>303.0</u>
HYDRAULIC HEIGHT (FT):	<u>7</u>	EL. MAXIMUM POOL (FT):	<u>310.0</u>

☐ YES

☐ NO

☐ YES

☐ NO

NAME OF DAM: <u>Ash Pond 1</u>		STATE ID #: <u>MO-0001171</u>	
INSPECTION DATE: <u>10/6/2010 & 10/7/2010</u>		NID ID #: <u>0</u>	
<u>INSPECTION SUMMARY</u>			
DATE OF INSPECTION: <u>10/6/2010 & 10/7/2010</u>		DATE OF PREVIOUS INSPECTION: _____	
TEMPERATURE/WEATHER: <u>Sunny, 70 degrees Fahrenheit</u>		ARMY CORPS PHASE I: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If YES, date _____	
CONSULTANT: <u>GZA GeoEnvironmental, Inc</u>		PREVIOUS DCR PHASE I: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If YES, date _____	
BENCHMARK/DATUM: <u>Mean Sea Level</u>			
OVERALL PHYSICAL CONDITION OF DAM: <u>FAIR</u>		DATE OF LAST REHABILITATION: <u>N/A</u>	
SPILLWAY CAPACITY: <u>0-50% of the SDF or Unknown</u>			
EL. POOL DURING INSP.: <u>303</u>		EL. TAILWATER DURING INSP.: <u>303</u>	
<u>PERSONS PRESENT AT INSPECTION</u>			
<u>NAME</u>	<u>TITLE/POSITION</u>	<u>REPRESENTING</u>	
Doug Simon	Geological Engineering	GZA GeoEnvironmental, Inc	
Patrick Harrison, P.E.	Senior Geotechnical Eng.	GZA GeoEnvironmental, Inc	
<u>EVALUATION INFORMATION</u>			
Click on box to select E-code		Click on box to select E-code	
E1) TYPE OF DESIGN	<div style="border: 1px solid black; padding: 2px;">1</div>	E8) LOW-LEVEL OUTLET CONDITION	<div style="border: 1px solid black; padding: 2px;">1</div>
E2) LEVEL OF MAINTENANCE	<div style="border: 1px solid black; padding: 2px;">3</div>	E9) SPILLWAY DESIGN FLOOD CAPACITY	<div style="border: 1px solid black; padding: 2px;">1</div>
E3) EMERGENCY ACTION PLAN	<div style="border: 1px solid black; padding: 2px;">1</div>	E10) OVERALL PHYSICAL CONDITION	<div style="border: 1px solid black; padding: 2px;">3</div>
E4) EMBANKMENT SEEPAGE	<div style="border: 1px solid black; padding: 2px;">5</div>	E11) ESTIMATED REPAIR COST	
E5) EMBANKMENT CONDITION	<div style="border: 1px solid black; padding: 2px;">5</div>	ROADWAY OVER CREST	<div style="border: 1px solid black; padding: 2px;">NO</div>
E6) CONCRETE CONDITION	<div style="border: 1px solid black; padding: 2px;">N/A</div>	BRIDGE NEAR DAM	<div style="border: 1px solid black; padding: 2px;">NO</div>
E7) LOW-LEVEL OUTLET CAPACITY	<div style="border: 1px solid black; padding: 2px;">1</div>		
NAME OF INSPECTING ENGINEER: Patrick Harrison, P.E.; Doug Simon SIGNATURE: _____			

NAME OF DAM: <u>Ash Pond 1</u>		STATE ID #: <u>MO-0001171</u>	
INSPECTION DATE: <u>10/6/2010 & 10/7/2010</u>		NID ID #: <u>0</u>	
OWNER: ORGANIZATION <u>Associated Electric Cooperative, Inc.</u> NAME/TITLE _____ STREET <u>2814 S. Golden, P.O. Box 754</u> TOWN, STATE, ZIP <u>Springfield, Missouri 65801-0754</u> PHONE <u>573-643-2211</u> EMERGENCY PH. # <u>573-379-0451</u> FAX _____ EMAIL _____ OWNER TYPE <u>Private</u>		CARETAKER: ORGANIZATION <u>Associated Electric Cooperative, Inc.</u> NAME/TITLE <u>Duane Highley, PE</u> STREET <u>41 Saint Jude Park</u> TOWN, STATE, ZIP <u>Marston, Missouri</u> PHONE <u>573-643-2211</u> EMERGENCY PH. # <u>573-379-0451</u> FAX _____ EMAIL <u>duanehighley@aeci.org</u>	
PRIMARY SPILLWAY TYPE <u>N/A</u>			
SPILLWAY LENGTH (FT) <u>N/A</u>	SPILLWAY CAPACITY (CFS) <u>N/A</u>		
AUXILIARY SPILLWAY TYPE <u>N/A</u>	AUX. SPILLWAY CAPACITY (CFS) <u>N/A</u>		
NUMBER OF OUTLETS <u>One</u>	OUTLET(S) CAPACITY (CFS) <u>Unknown</u>		
TYPE OF OUTLETS <u>Irregular earthen channel</u>	TOTAL DISCHARGE CAPACITY (CFS) <u>Unknown</u>		
DRAINAGE AREA (SQ MI) <u>None outside impoundment</u>	SPILLWAY DESIGN FLOOD (PERIOD/CFS) <u>N/A</u>		
HAS DAM BEEN BREACHED OR OVERTOPPED <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, PROVIDE DATE(S) _____			
FISH LADDER (LIST TYPE IF PRESENT) <u>N/A</u>			
DOES CREST SUPPORT PUBLIC ROAD? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		IF YES, ROAD NAME: _____	
PUBLIC BRIDGE WITHIN 50' OF DAM? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		IF YES, ROAD/BRIDGE NAME: _____	
		MHD BRIDGE NO. (IF APPLICABLE) _____	

NAME OF DAM: <u>Ash Pond 1</u>		STATE ID #: <u>MO-0001171</u>			
INSPECTION DATE: <u>10/6/2010 & 10/7/2010</u>		NID ID #: <u>0</u>			
EMBANKMENT (CREST)					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	1. SURFACE TYPE	Paved access road on west- southern crest had gravel cover, eastern inaccessible		x	
	2. SURFACE CRACKING	None Observed	x		
	3. SINKHOLES, ANIMAL BURROWS	None Observed	x		
	4. VERTICAL ALIGNMENT (DEPRESSIONS)	No depressions observed	x		
	5. HORIZONTAL ALIGNMENT	No problems observed	x		
	6. RUTS AND/OR PUDDLES	No problems observed	x		
	7. VEGETATION (PRESENCE/CONDITION)	mostly pavement and gravel with some grass	x		
	8. ABUTMENT CONTACT	N/A	x		
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					

NAME OF DAM: <u>Ash Pond 1</u>		STATE ID #: <u>MO-0001171</u>			
INSPECTION DATE: <u>10/6/2010 & 10/7/2010</u>		NID ID #: <u>0</u>			
EMBANKMENT (D/S SLOPE)					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S SLOPE	1. WET AREAS (NO FLOW)	None Observed	x		
	2. SEEPAGE	None Observed	x		
	3. SLIDE, SLOUGH, SCARP	minor sloughing in one area of the western embankment			x
	4. EMB.-ABUTMENT CONTACT	N/A	x		
	5. SINKHOLE/ANIMAL BURROWS	None Observed	x		
	6. EROSION	Erosion on western embankment and near the northern corner of the impoundment			x
	7. UNUSUAL MOVEMENT	None Observed	x		
	8. VEGETATION (PRESENCE/CONDITION)	Poor vegetation where the fence meets the western embankment.			x
		Trees up to approx. 4" near the toe of the southwest corner			
ADDITIONAL COMMENTS: <u>Poor access to the embankment that separates the AP1 and the SP1</u> <u> </u> <u> </u> <u> </u> <u> </u>					

NAME OF DAM: <u>Ash Pond 1</u>		STATE ID #: <u>MO-0001171</u>			
INSPECTION DATE: <u>10/6/2010 & 10/7/2010</u>		NID ID #: <u>0</u>			
EMBANKMENT (U/S SLOPE)					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S SLOPE	1. SLIDE, SLOUGH, SCARP	N/A	X		
	2. SLOPE PROTECTION TYPE AND COND.	N/A	X		
	3. SINKHOLE/ANIMAL BURROWS	N/A	X		
	4. EMB.-ABUTMENT CONTACT	N/A	X		
	5. EROSION	N/A	X		
	6. UNUSUAL MOVEMENT	N/A	X		
	7. VEGETATION (PRESENCE/CONDITION)	N/A	X		
ADDITIONAL COMMENTS: <u>Ash has been stockpiled to an elevation approximately equal to or higher than the embankments in most locations of AP1.</u> <u>Therefore, the upstream slope was covered by ash and not visible for inspection.</u> 					

NAME OF DAM: <u>Ash Pond 1</u>		STATE ID #: <u>MO-0001171</u>			
INSPECTION DATE: <u>10/6/2010 & 10/7/2010</u>		NID ID #: <u>0</u>			
INSTRUMENTATION					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
INSTR.	1. PIEZOMETERS	None present	x		
	2. OBSERVATION WELLS	P-5	x		
	3. STAFF GAGE AND RECORDER	None present	x		
	4. WEIRS	None Present	x		
	5. INCLINOMETERS	None Present	x		
	6. SURVEY MONUMENTS	None present	x		
	7. DRAINS	None Present	x		
	8. FREQUENCY OF READINGS	No measurements are taken	x		
	9. LOCATION OF READINGS		x		
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					

DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM: <u>Ash Pond 2</u>	STATE ID #: <u>MO-0001171</u>
REGISTERED: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	NID ID #: _____
STATE SIZE CLASSIFICATION: _____	STATE HAZARD CLASSIFICATION: <u>Environmental Class III (low)</u>
	CHANGE IN HAZARD CLASSIFICATION REQUESTED?: _____
<u>DAM LOCATION INFORMATION</u>	
CITY/TOWN: <u>Marston</u>	COUNTY: <u>New Madrid, Missouri</u>
DAM LOCATION: <u>41 Saint Jude Park, Marston, Missouri</u> (street address if known)	ALTERNATE DAM NAME: <u>N/A</u>
USGS QUAD.: <u>New Madrid and Point Pleasant, MO (1971 & 1982)</u>	LAT.: <u>89 33' 27"</u> LONG.: <u>36 30' 06"</u>
DRAINAGE BASIN: _____	RIVER: <u>The Mississippi River</u>
IMPOUNDMENT NAME(S): <u>Ash Pond 2</u>	
<u>GENERAL DAM INFORMATION</u>	
TYPE OF DAM: <u>bermed</u>	OVERALL LENGTH (FT): <u>7,800</u>
PURPOSE OF DAM: <u>Ash Impoundment</u>	NORMAL POOL STORAGE (ACRE-FT): _____ (Estimated)
YEAR BUILT: <u>1994</u>	MAXIMUM POOL STORAGE (ACRE-FT): <u>1560</u>
STRUCTURAL HEIGHT (FT): <u>20</u>	EL. NORMAL POOL (FT): <u>303.0</u>
HYDRAULIC HEIGHT (FT): <u>16</u>	EL. MAXIMUM POOL (FT): <u>307.0</u>

☐ YES

☐ NO

☐ YES

☐ NO

NAME OF DAM: <u>Ash Pond 2</u>		STATE ID #: <u>MO-0001171</u>															
INSPECTION DATE: <u>10/6/2010 and 10/7/2010</u>		NID ID #: <u>0</u>															
<u>INSPECTION SUMMARY</u>																	
DATE OF INSPECTION: <u>10/6/2010 and 10/7/2010</u>		DATE OF PREVIOUS INSPECTION: _____															
TEMPERATURE/WEATHER: <u>Sunny, 70 degrees Fahrenheit</u>		ARMY CORPS PHASE I: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If YES, date _____															
CONSULTANT: <u>GZA GeoEnvironmental, Inc</u>		PREVIOUS DCR PHASE I: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If YES, date _____															
BENCHMARK/DATUM: <u>Mean Sea Level</u>																	
OVERALL PHYSICAL CONDITION OF DAM: <u>FAIR</u>		DATE OF LAST REHABILITATION: <u>N/A</u>															
SPILLWAY CAPACITY: <u>0-50% of the SDF or Unknown</u>																	
EL. POOL DURING INSP.: <u>303</u>		EL. TAILWATER DURING INSP.: <u>N/A</u>															
<u>PERSONS PRESENT AT INSPECTION</u>																	
<u>NAME</u>	<u>TITLE/POSITION</u>	<u>REPRESENTING</u>															
Doug Simon	Geological Engineering	GZA GeoEnvironmental, Inc															
Patrick Harrison, P.E.	Senior Geotechnical Eng.	GZA GeoEnvironmental, Inc															
<u>EVALUATION INFORMATION</u>																	
E1) TYPE OF DESIGN E2) LEVEL OF MAINTENANCE E3) EMERGENCY ACTION PLAN E4) EMBANKMENT SEEPAGE E5) EMBANKMENT CONDITION E6) CONCRETE CONDITION E7) LOW-LEVEL OUTLET CAPACITY		Click on box to select E-code <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>4</td></tr> <tr><td>3</td></tr> <tr><td>1</td></tr> <tr><td>5</td></tr> <tr><td>1</td></tr> <tr><td>N/A</td></tr> <tr><td>1</td></tr> </table>	4	3	1	5	1	N/A	1	E8) LOW-LEVEL OUTLET CONDITION E9) SPILLWAY DESIGN FLOOD CAPACITY E10) OVERALL PHYSICAL CONDITION E11) ESTIMATED REPAIR COST ROADWAY OVER CREST BRIDGE NEAR DAM	Click on box to select E-code <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>1</td></tr> <tr><td>1</td></tr> <tr><td>3</td></tr> <tr><td> </td></tr> <tr><td>NO</td></tr> <tr><td>NO</td></tr> </table>	1	1	3		NO	NO
4																	
3																	
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5																	
1																	
N/A																	
1																	
1																	
1																	
3																	
NO																	
NO																	
NAME OF INSPECTING ENGINEER: Patrick Harrison, P.E.; Doug Simon SIGNATURE: _____																	

NAME OF DAM: <u>Ash Pond 2</u>		STATE ID #: <u>MO-0001171</u>	
INSPECTION DATE: <u>10/6/2010 and 10/7/2010</u>		NID ID #: <u>0</u>	
OWNER: ORGANIZATION <u>Associated Electric Cooperative, Inc.</u> NAME/TITLE _____ STREET <u>2814 S. Golden, P.O. Box 754</u> TOWN, STATE, ZIP <u>Springfield, Missouri 65801-0754</u> PHONE <u>573-643-2211</u> EMERGENCY PH. # <u>573-379-0451</u> FAX _____ EMAIL _____ OWNER TYPE <u>Private</u>		CARETAKER: ORGANIZATION <u>Associated Electric Cooperative, Inc.</u> NAME/TITLE <u>Duane Highley, PE</u> STREET <u>41 Saint Jude Park</u> TOWN, STATE, ZIP <u>Marston, Missouri</u> PHONE <u>573-643-2211</u> EMERGENCY PH. # <u>573-379-0451</u> FAX _____ EMAIL <u>duanehighley@aeci.org</u>	
PRIMARY SPILLWAY TYPE <u>N/A</u>			
SPILLWAY LENGTH (FT) <u>N/A</u>		SPILLWAY CAPACITY (CFS) <u>N/A</u>	
AUXILIARY SPILLWAY TYPE <u>N/A</u>		AUX. SPILLWAY CAPACITY (CFS) <u>N/A</u>	
NUMBER OF OUTLETS <u>(3) 8 inch diameter Pipelines</u>		OUTLET(S) CAPACITY (CFS) <u>Unknown</u>	
TYPE OF OUTLETS <u>Pipelines</u>		TOTAL DISCHARGE CAPACITY (CFS) <u>Unknown</u>	
DRAINAGE AREA (SQ MI) <u>None outside impoundment</u>		SPILLWAY DESIGN FLOOD (PERIOD/CFS) <u>Unknown</u>	
HAS DAM BEEN BREACHED OR OVERTOPPED <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, PROVIDE DATE(S) _____			
FISH LADDER (LIST TYPE IF PRESENT) <u>N/A</u>			
DOES CREST SUPPORT PUBLIC ROAD? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		IF YES, ROAD NAME: _____	
PUBLIC BRIDGE WITHIN 50' OF DAM? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		IF YES, ROAD/BRIDGE NAME: _____	
		MHD BRIDGE NO. (IF APPLICABLE) _____	

NAME OF DAM: <u>Ash Pond 2</u>		STATE ID #: <u>MO-0001171</u>			
INSPECTION DATE: <u>10/6/2010 and 10/7/2010</u>		NID ID #: <u>0</u>			
EMBANKMENT (CREST)					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	1. SURFACE TYPE	gravel access road with erosion on southern embankment			x
	2. SURFACE CRACKING	None Observed	x		
	3. SINKHOLES, ANIMAL BURROWS	None Observed	x		
	4. VERTICAL ALIGNMENT (DEPRESSIONS)	No depressions observed	x		
	5. HORIZONTAL ALIGNMENT	No problems observed	x		
	6. RUTS AND/OR PUDDLES	No problems observed	x		
	7. VEGETATION (PRESENCE/CONDITION)	None observed	x		
	8. ABUTMENT CONTACT	N/A	x		
ADDITIONAL COMMENTS: <u>Erosion noted in several areas of the gravel access road on the southern embankment</u> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div>					

NAME OF DAM: <u>Ash Pond 2</u>		STATE ID #: <u>MO-0001171</u>			
INSPECTION DATE: <u>10/6/2010 and 10/7/2010</u>		NID ID #: <u>0</u>			
EMBANKMENT (D/S SLOPE)					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S SLOPE	1. WET AREAS (NO FLOW)	None Observed	x		
	2. SEEPAGE	None Observed	x		
	3. SLIDE, SLOUGH, SCARP	rutting from equipment present on the eastern slope			x
	4. EMB.-ABUTMENT CONTACT	N/A	x		
	5. SINKHOLE/ANIMAL BURROWS	None Observed	x		
	6. EROSION	wave action erosion from the MUW pond			x
	7. UNUSUAL MOVEMENT	None Observed	x		
	8. VEGETATION (PRESENCE/CONDITION)	Tall grass along the northern embankment			x
ADDITIONAL COMMENTS: <u>On the southern portion of the slope, wave action erosion has created a vertical slope three feet tall in one location</u> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div>					

NAME OF DAM: <u>Ash Pond 2</u>		STATE ID #: <u>MO-0001171</u>			
INSPECTION DATE: <u>10/6/2010 and 10/7/2010</u>		NID ID #: <u>0</u>			
EMBANKMENT (U/S SLOPE)					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S SLOPE	1. SLIDE, SLOUGH, SCARP	None Observed	x		
	2. SLOPE PROTECTION TYPE AND COND.	Hyperflex© membrane; Membrane is exposed on eastern portion of the impoundment.	x		
	3. SINKHOLE/ANIMAL BURROWS	None Observed	x		
	4. EMB.-ABUTMENT CONTACT	None Observed	x		
	5. EROSION	None Observed	x		
	6. UNUSUAL MOVEMENT	None Observed	x		
	7. VEGETATION (PRESENCE/CONDITION)	NA	x		
ADDITIONAL COMMENTS: <u>Ash has been stockpiled to an elevation approximately equal to or higher than the embankments on the western portion of AP2.</u> <u>Therefore, the upstream slope on the western portion was covered by ash and not visible for inspection.</u> <u>Where otherwise not covered, the upstream slope was covered with a Hyperflex © liner that appeared to be in fair condition</u> 					

NAME OF DAM: <u>Ash Pond 2</u>		STATE ID #: <u>MO-0001171</u>			
INSPECTION DATE: <u>10/6/2010 and 10/7/2010</u>		NID ID #: <u>0</u>			
INSTRUMENTATION					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
INSTR.	1. PIEZOMETERS	P-6 through P-8	x		
	2. OBSERVATION WELLS	None Present	x		
	3. STAFF GAGE AND RECORDER	None Present	x		
	4. WEIRS	None Present	x		
	5. INCLINOMETERS	None Present	x		
	6. SURVEY MONUMENTS	None present	x		
	7. DRAINS	None Present	x		
	8. FREQUENCY OF READINGS	No measurements are taken	x		
	9. LOCATION OF READINGS		x		
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					

DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM:	<u>Slag Pond 1</u>	STATE ID #:	<u>MO-0001171</u>
REGISTERED:	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	NID ID #:	<u> </u>
STATE SIZE CLASSIFICATION:	<u> </u>	STATE HAZARD CLASSIFICATION:	<u>Environmental Class III (low)</u>
		CHANGE IN HAZARD CLASSIFICATION REQUESTED?:	<u> </u>
<u><i>DAM LOCATION INFORMATION</i></u>			
CITY/TOWN:	<u>Marston</u>	COUNTY:	<u>New Madrid, Missouri</u>
DAM LOCATION: (street address if known)	<u>41 Saint Jude Park, Marston, Missouri</u>	ALTERNATE DAM NAME:	<u>N/A</u>
USGS QUAD.:	<u>New Madrid and Point Pleasant, MO (1971 & 1982)</u>	LAT.:	<u>89 33' 24"</u>
		LONG.:	<u>36 30' 27"</u>
DRAINAGE BASIN:	<u> </u>	RIVER:	<u>The Mississippi River</u>
IMPOUNDMENT NAME(S):	<u>Slag Pond 1</u>		
<u><i>GENERAL DAM INFORMATION</i></u>			
TYPE OF DAM:	<u>Incised and bermed</u>	OVERALL LENGTH (FT):	<u>6,700</u>
PURPOSE OF DAM:	<u>Slag Impoundment</u>	NORMAL POOL STORAGE (ACRE-FT):	<u> </u>
YEAR BUILT:	<u>1970's</u>	MAXIMUM POOL STORAGE (ACRE-FT):	<u>1137</u>
STRUCTURAL HEIGHT (FT):	<u>20</u>	EL. NORMAL POOL (FT):	<u>303.0</u>
HYDRAULIC HEIGHT (FT):	<u>7</u>	EL. MAXIMUM POOL (FT):	<u>310.0</u>

☐ YES

☐ NO

☐ YES

☐ NO

NAME OF DAM: <u>Slag Pond 1</u>		STATE ID #: <u>MO-0001171</u>	
INSPECTION DATE: <u>10/6/10 & 10/7/10</u>		NID ID #: <u>0</u>	
<u>INSPECTION SUMMARY</u>			
DATE OF INSPECTION: <u>10/6/10 & 10/7/10</u>		DATE OF PREVIOUS INSPECTION: _____	
TEMPERATURE/WEATHER: <u>Sunny, 70 degrees Fahrenheit</u>		ARMY CORPS PHASE I: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If YES, date _____	
CONSULTANT: <u>GZA GeoEnvironmental, Inc</u>		PREVIOUS DCR PHASE I: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If YES, date _____	
BENCHMARK/DATUM: <u>Mean Sea Level</u>			
OVERALL PHYSICAL CONDITION OF DAM: <u>FAIR</u>		DATE OF LAST REHABILITATION: <u>N/A</u>	
SPILLWAY CAPACITY: <u>0-50% of the SDF or Unknown</u>			
EL. POOL DURING INSP.: <u>303</u>		EL. TAILWATER DURING INSP.: <u>303</u>	
<u>PERSONS PRESENT AT INSPECTION</u>			
<u>NAME</u>	<u>TITLE/POSITION</u>	<u>REPRESENTING</u>	
Doug Simon	Geological Engineering	GZA GeoEnvironmental, Inc	
Patrick Harrison, P.E.	Senior Geotechnical Eng.	GZA GeoEnvironmental, Inc	
<u>EVALUATION INFORMATION</u>			
<div style="display: flex; justify-content: space-between;"> <div> E1) TYPE OF DESIGN E2) LEVEL OF MAINTENANCE E3) EMERGENCY ACTION PLAN E4) EMBANKMENT SEEPAGE E5) EMBANKMENT CONDITION E6) CONCRETE CONDITION E7) LOW-LEVEL OUTLET CAPACITY </div> <div> Click on box to select E-code <div style="border: 1px solid black; padding: 2px;">4</div> <div style="border: 1px solid black; padding: 2px;">3</div> <div style="border: 1px solid black; padding: 2px;">1</div> <div style="border: 1px solid black; padding: 2px;">5</div> <div style="border: 1px solid black; padding: 2px;">2</div> <div style="border: 1px solid black; padding: 2px;">N/A</div> <div style="border: 1px solid black; padding: 2px;">1</div> </div> </div>		<div style="display: flex; justify-content: space-between;"> <div> E8) LOW-LEVEL OUTLET CONDITION E9) SPILLWAY DESIGN FLOOD CAPACITY E10) OVERALL PHYSICAL CONDITION E11) ESTIMATED REPAIR COST ROADWAY OVER CREST BRIDGE NEAR DAM </div> <div> Click on box to select E-code <div style="border: 1px solid black; padding: 2px;">1</div> <div style="border: 1px solid black; padding: 2px;">1</div> <div style="border: 1px solid black; padding: 2px;">3</div> <div style="border: 1px solid black; padding: 2px;"> </div> <div style="border: 1px solid black; padding: 2px;">NO</div> <div style="border: 1px solid black; padding: 2px;">NO</div> </div> </div>	
NAME OF INSPECTING ENGINEER: Patrick Harrison, P.E.; Doug Simon SIGNATURE: _____			

NAME OF DAM: <u>Slag Pond 1</u>		STATE ID #: <u>MO-0001171</u>	
INSPECTION DATE: <u>10/6/10 & 10/7/10</u>		NID ID #: <u>0</u>	
OWNER: ORGANIZATION <u>Associated Electric Cooperative, Inc.</u> NAME/TITLE _____ STREET <u>2814 S. Golden, P.O. Box 754</u> TOWN, STATE, ZIP <u>Springfield, Missouri 65801-0754</u> PHONE <u>573-643-2211</u> EMERGENCY PH. # <u>573-379-0451</u> FAX _____ EMAIL _____ OWNER TYPE <u>Private</u>		CARETAKER: ORGANIZATION <u>Associated Electric Cooperative, Inc.</u> NAME/TITLE <u>Duane Highley, PE</u> STREET <u>41 Saint Jude Park</u> TOWN, STATE, ZIP <u>Marston, Missouri</u> PHONE <u>573-643-2211</u> EMERGENCY PH. # <u>573-379-0451</u> FAX _____ EMAIL <u>duanehighley@aeci.org</u>	
PRIMARY SPILLWAY TYPE <u>None Present</u>			
SPILLWAY LENGTH (FT) <u>N/A</u>	SPILLWAY CAPACITY (CFS) <u>N/A</u>		
AUXILIARY SPILLWAY TYPE <u>N/A</u>	AUX. SPILLWAY CAPACITY (CFS) <u>N/A</u>		
NUMBER OF OUTLETS <u>One</u>	OUTLET(S) CAPACITY (CFS) <u>Unknown</u>		
TYPE OF OUTLETS <u>Unlined, earthen channel</u>	TOTAL DISCHARGE CAPACITY (CFS) <u>Unknown</u>		
DRAINAGE AREA (SQ MI) <u>None outside impoundment</u>	SPILLWAY DESIGN FLOOD (PERIOD/CFS) <u>Unknown</u>		
HAS DAM BEEN BREACHED OR OVERTOPPED <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, PROVIDE DATE(S) _____			
FISH LADDER (LIST TYPE IF PRESENT) <u>N/A</u>			
DOES CREST SUPPORT PUBLIC ROAD? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		IF YES, ROAD NAME: _____	
PUBLIC BRIDGE WITHIN 50' OF DAM? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		IF YES, ROAD/BRIDGE NAME: _____	
		MHD BRIDGE NO. (IF APPLICABLE) _____	

NAME OF DAM: <u>Slag Pond 1</u>		STATE ID #: <u>MO-0001171</u>			
INSPECTION DATE: <u>10/6/10 & 10/7/10</u>		NID ID #: <u>0</u>			
EMBANKMENT (CREST)					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	1. SURFACE TYPE	gravel access road on northern, eastern, southern. Western inaccessible.		x	
	2. SURFACE CRACKING	None Observed	x		
	3. SINKHOLES, ANIMAL BURROWS	None Observed	x		
	4. VERTICAL ALIGNMENT (DEPRESSIONS)	No depressions observed	x		
	5. HORIZONTAL ALIGNMENT	No problems observed	x		
	6. RUTS AND/OR PUDDLES	No problems observed	x		
	7. VEGETATION (PRESENCE/CONDITION)	regularly mowed grass on southeastern	x		
	8. ABUTMENT CONTACT	N/A	x		
ADDITIONAL COMMENTS: <u>The crest of the southeastern embankment had a grass cover that appeared to be regularly mowed</u> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div>					

NAME OF DAM: <u>Slag Pond 1</u>		STATE ID #: <u>MO-0001171</u>			
INSPECTION DATE: <u>10/6/10 & 10/7/10</u>		NID ID #: <u>0</u>			
EMBANKMENT (D/S SLOPE)					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S SLOPE	1. WET AREAS (NO FLOW)	None Observed	x		
	2. SEEPAGE	None Observed	x		
	3. SLIDE, SLOUGH, SCARP	None Observed	x		
	4. EMB.-ABUTMENT CONTACT	N/A	x		
	5. SINKHOLE/ANIMAL BURROWS	None Observed	x		
	6. EROSION	Erosion near the northeast corner and wave action erosion at the Raw Water Pond			x
	7. UNUSUAL MOVEMENT	None Observed	x		
	8. VEGETATION (PRESENCE/CONDITION)	The upper portion of the embankment appeared to be regularly mowed and the lower 2 to 5 feet had mature trees up to approx 25 inches in diameter			x
ADDITIONAL COMMENTS: <u>Trees on the embankment toe should be removed and the erosional feature repaired</u> <u>The western portion of the southern embankment was covered with a Hyperflex© liner and appeared to be in fair condition</u> <u>There was wave action erosion on the downstream slope of the southeastern embankment</u> <u>In addition, there was an eroded channel near the intersection of the southeastern and southern embankments</u>					

NAME OF DAM: <u>Slag Pond 1</u>		STATE ID #: <u>MO-0001171</u>			
INSPECTION DATE: <u>10/6/10 & 10/7/10</u>		NID ID #: <u>0</u>			
EMBANKMENT (U/S SLOPE)					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S SLOPE	1. SLIDE, SLOUGH, SCARP	N/A	x		
	2. SLOPE PROTECTION TYPE AND COND.	N/A	x		
	3. SINKHOLE/ANIMAL BURROWS	N/A	x		
	4. EMB.-ABUTMENT CONTACT	N/A	x		
	5. EROSION	N/A	x		
	6. UNUSUAL MOVEMENT	N/A	x		
	7. VEGETATION (PRESENCE/CONDITION)	Trees up to 4 inches in diameter on the southeastern embankment			x
ADDITIONAL COMMENTS: <u>Ash has been stockpiled to an elevation approximately equal to or higher than the embankments in most locations of SP1.</u> <u>Therefore, the upstream slope was covered by ash and not visible for inspection.</u> 					

NAME OF DAM: <u>Slag Pond 1</u>		STATE ID #: <u>MO-0001171</u>			
INSPECTION DATE: <u>10/6/10 & 10/7/10</u>		NID ID #: <u>0</u>			
INSTRUMENTATION					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
INSTR.	1. PIEZOMETERS	P-1 through P-3	x		
	2. OBSERVATION WELLS	None present	x		
	3. STAFF GAGE AND RECORDER	None present	x		
	4. WEIRS	None Present	x		
	5. INCLINOMETERS	None Present	x		
	6. SURVEY MONUMENTS	None present	x		
	7. DRAINS	None Present	x		
	8. FREQUENCY OF READINGS	No measurements are taken	x		
	9. LOCATION OF READINGS		x		
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					

DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM: <u>Slag Pond 2</u>	STATE ID #: <u>MO-0001171</u>
REGISTERED: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	NID ID #: _____
STATE SIZE CLASSIFICATION: <u>Small</u>	STATE HAZARD CLASSIFICATION: <u>Environmental Class III (low)</u>
	CHANGE IN HAZARD CLASSIFICATION REQUESTED?: _____
<u>DAM LOCATION INFORMATION</u>	
CITY/TOWN: <u>Marston</u>	COUNTY: <u>New Madrid, Missouri</u>
DAM LOCATION: <u>41 Saint Jude Park, Marston, Missouri</u> (street address if known)	ALTERNATE DAM NAME: <u>N/A</u>
USGS QUAD.: <u>New Madrid and Point Pleasant, MO (1971 & 1982)</u>	LAT.: <u>89 33' 34"</u> LONG.: <u>36 30' 52"</u>
DRAINAGE BASIN: _____	RIVER: <u>The Mississippi River</u>
IMPOUNDMENT NAME(S): <u>Slag Pond 2</u>	
<u>GENERAL DAM INFORMATION</u>	
TYPE OF DAM: <u>Incised and bermed</u>	OVERALL LENGTH (FT): <u>3,000</u>
PURPOSE OF DAM: <u>Slag Impoundment</u>	NORMAL POOL STORAGE (ACRE-FT): _____
YEAR BUILT: <u>1984</u>	MAXIMUM POOL STORAGE (ACRE-FT): <u>14</u>
STRUCTURAL HEIGHT (FT): <u>20</u>	EL. NORMAL POOL (FT): <u>299.0</u>
HYDRAULIC HEIGHT (FT): <u>3</u>	EL. MAXIMUM POOL (FT): <u>302.0</u>

☐ YES

☐ NO

☐ YES

☐ NO

NAME OF DAM: <u>Slag Pond 2</u>		STATE ID #: <u>MO-0001171</u>														
INSPECTION DATE: <u>10/6/10 & 10/7/10</u>		NID ID #: <u>0</u>														
<u>INSPECTION SUMMARY</u>																
DATE OF INSPECTION: <u>10/6/10 & 10/7/10</u>		DATE OF PREVIOUS INSPECTION: _____														
TEMPERATURE/WEATHER: <u>Sunny, 70 degrees Fahrenheit</u>		ARMY CORPS PHASE I: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If YES, date _____														
CONSULTANT: <u>GZA GeoEnvironmental, Inc</u>		PREVIOUS DCR PHASE I: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If YES, date _____														
BENCHMARK/DATUM: <u>Mean Sea Level</u>																
OVERALL PHYSICAL CONDITION OF DAM: <u>FAIR</u>		DATE OF LAST REHABILITATION: <u>N/A</u>														
SPILLWAY CAPACITY: <u>0-50% of the SDF or Unknown</u>																
EL. POOL DURING INSP.: <u>303</u>		EL. TAILWATER DURING INSP.: <u>303</u>														
<u>PERSONS PRESENT AT INSPECTION</u>																
<u>NAME</u>	<u>TITLE/POSITION</u>	<u>REPRESENTING</u>														
Doug Simon	Geological Engineering	GZA GeoEnvironmental, Inc														
Patrick Harrison, P.E.	Senior Geotechnical Eng.	GZA GeoEnvironmental, Inc														
<u>EVALUATION INFORMATION</u>																
E1) TYPE OF DESIGN E2) LEVEL OF MAINTENANCE E3) EMERGENCY ACTION PLAN E4) EMBANKMENT SEEPAGE E5) EMBANKMENT CONDITION E6) CONCRETE CONDITION E7) LOW-LEVEL OUTLET CAPACITY		E8) LOW-LEVEL OUTLET CONDITION E9) SPILLWAY DESIGN FLOOD CAPACITY E10) OVERALL PHYSICAL CONDITION E11) ESTIMATED REPAIR COST ROADWAY OVER CREST BRIDGE NEAR DAM														
Click on box to select E-code <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>1</td></tr> <tr><td>3</td></tr> <tr><td>1</td></tr> <tr><td>5</td></tr> <tr><td>2</td></tr> <tr><td>N/A</td></tr> <tr><td>1</td></tr> </table>		1	3	1	5	2	N/A	1	Click on box to select E-code <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>1</td></tr> <tr><td>1</td></tr> <tr><td>3</td></tr> <tr><td> </td></tr> <tr><td>NO</td></tr> <tr><td>NO</td></tr> </table>		1	1	3		NO	NO
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3																
NO																
NO																
NAME OF INSPECTING ENGINEER: Patrick Harrison, P.E.; Doug Simon SIGNATURE: _____																

NAME OF DAM: <u>Slag Pond 2</u>		STATE ID #: <u>MO-0001171</u>	
INSPECTION DATE: <u>10/6/10 & 10/7/10</u>		NID ID #: <u>0</u>	
OWNER: ORGANIZATION <u>Associated Electric Cooperative, Inc.</u> NAME/TITLE _____ STREET <u>2814 S. Golden, P.O. Box 754</u> TOWN, STATE, ZIP <u>Springfield, Missouri 65801-0754</u> PHONE <u>573-643-2211</u> EMERGENCY PH. # <u>573-379-0451</u> FAX _____ EMAIL _____ OWNER TYPE <u>Private</u>		CARETAKER: ORGANIZATION <u>Associated Electric Cooperative, Inc.</u> NAME/TITLE <u>Duane Highley, PE</u> STREET <u>41 Saint Jude Park</u> TOWN, STATE, ZIP <u>Marston, Missouri</u> PHONE <u>573-643-2211</u> EMERGENCY PH. # <u>573-379-0451</u> FAX _____ EMAIL <u>duanehighley@aeci.org</u>	
PRIMARY SPILLWAY TYPE <u>decant structure</u>			
SPILLWAY LENGTH (FT) <u>N/A</u>		SPILLWAY CAPACITY (CFS) <u>N/A</u>	
AUXILIARY SPILLWAY TYPE <u>N/A</u>		AUX. SPILLWAY CAPACITY (CFS) <u>N/A</u>	
NUMBER OF OUTLETS <u>One</u>		OUTLET(S) CAPACITY (CFS) <u>Unknown</u>	
TYPE OF OUTLETS <u>One decant</u>		TOTAL DISCHARGE CAPACITY (CFS) <u>Unknown</u>	
DRAINAGE AREA (SQ MI) <u>None outside impoundment</u>		SPILLWAY DESIGN FLOOD (PERIOD/CFS) <u>Unknown</u>	
HAS DAM BEEN BREACHED OR OVERTOPPED <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, PROVIDE DATE(S) _____			
FISH LADDER (LIST TYPE IF PRESENT) <u>N/A</u>			
DOES CREST SUPPORT PUBLIC ROAD? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		IF YES, ROAD NAME: _____	
PUBLIC BRIDGE WITHIN 50' OF DAM? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		IF YES, ROAD/BRIDGE NAME: _____	
		MHD BRIDGE NO. (IF APPLICABLE) _____	

NAME OF DAM: <u>Slag Pond 2</u>		STATE ID #: <u>MO-0001171</u>			
INSPECTION DATE: <u>10/6/10 & 10/7/10</u>		NID ID #: <u>0</u>			
EMBANKMENT (CREST)					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	1. SURFACE TYPE	gravel access road, the western portion was a paved levee road	x		
	2. SURFACE CRACKING	None Observed	x		
	3. SINKHOLES, ANIMAL BURROWS	None Observed	x		
	4. VERTICAL ALIGNMENT (DEPRESSIONS)	No depressions observed	x		
	5. HORIZONTAL ALIGNMENT	No problems observed	x		
	6. RUTS AND/OR PUDDLES	rutting in the southern portion of the eastern embankment gravel access road			x
	7. VEGETATION (PRESENCE/CONDITION)	regularly mowed grass	x		
	8. ABUTMENT CONTACT	N/A	x		
ADDITIONAL COMMENTS: <u>There was erosion in several areas of the gravel shoulder on the western embankment access road</u> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div>					

NAME OF DAM: <u>Slag Pond 2</u>		STATE ID #: <u>MO-0001171</u>			
INSPECTION DATE: <u>10/6/10 & 10/7/10</u>		NID ID #: <u>0</u>			
EMBANKMENT (D/S SLOPE)					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S SLOPE	1. WET AREAS (NO FLOW)	None Observed	x		
	2. SEEPAGE	Leaking pipe causing erosion in the western embankment			x
	3. SLIDE, SLOUGH, SCARP	Sloughing noted in the southern portion of the western embankment			x
	4. EMB.-ABUTMENT CONTACT	N/A	x		
	5. SINKHOLE/ANIMAL BURROWS	None Observed	x		
	6. EROSION	Eroded ditch in the northeast corner and generalized erosioin in the eastern slope			x
	7. UNUSUAL MOVEMENT	None Observed	x		
	8. VEGETATION (PRESENCE/CONDITION)	Trees up to 5" in diameter near the northeast corner			x
ADDITIONAL COMMENTS: <u>Part of the northwest portion of the SP2 is incised into the existing topography and no downstream slope is present</u> <u>A drainage ditch had been recently cut into the downstream toe of the northern portion of the western embankment</u> <u>The downstream slope of the SP2 included portions that were vegetated with grass that appeared to be regularly mowed, portions that consisted of rip rap, and portions that consisted of bare soil prone to erosion</u> <u>Leaking pipelines and erosional features should be repaired and trees removed from the toe of the impoundment</u>					

NAME OF DAM: <u>Slag Pond 2</u>		STATE ID #: <u>MO-0001171</u>			
INSPECTION DATE: <u>10/6/10 & 10/7/10</u>		NID ID #: <u>0</u>			
EMBANKMENT (U/S SLOPE)					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S SLOPE	1. SLIDE, SLOUGH, SCARP	None Observed	x		
	2. SLOPE PROTECTION TYPE AND COND.	None Observed	x		
	3. SINKHOLE/ANIMAL BURROWS	None Observed	x		
	4. EMB.-ABUTMENT CONTACT	None Observed	x		
	5. EROSION	Wave action erosion noted in the southeastern portion of the impoundment			x
	6. UNUSUAL MOVEMENT	None Observed	x		
	7. VEGETATION (PRESENCE/CONDITION)	None Observed	x		
ADDITIONAL COMMENTS: <u>Ash has been stockpiled to an elevation approximately equal to or higher than the embankments northern portion of SP2.</u> <u>Therefore, the upstream slope was covered by ash and not visible for inspection.</u> <u>Erosional features should be repaired</u> 					

NAME OF DAM: <u>Slag Pond 2</u>		STATE ID #: <u>MO-0001171</u>			
INSPECTION DATE: <u>10/6/10 & 10/7/10</u>		NID ID #: <u>0</u>			
INSTRUMENTATION					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
INSTR.	1. PIEZOMETERS	None present	x		
	2. OBSERVATION WELLS	None present	x		
	3. STAFF GAGE AND RECORDER	None present	x		
	4. WEIRS	None Present	x		
	5. INCLINOMETERS	None Present	x		
	6. SURVEY MONUMENTS	None present	x		
	7. DRAINS	None Present	x		
	8. FREQUENCY OF READINGS	No measurements are taken	x		
	9. LOCATION OF READINGS		x		
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					



Appendix D

Photographs




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 1	Date: 10/6/10		
Direction Photo Taken: Northwest			
Description: Upstream slope of the Slag Pond 2 Impoundment (SP2).			

Photo No. 2	Date: 10/6/10	
Direction Photo Taken: North		
Description: Upstream slope of the SP2.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 3	Date: 10/6/10		
Direction Photo Taken: Northeast			
Description: Upstream slope and discharge pipelines of the SP2.			

Photo No. 4	Date: 10/6/10	
Direction Photo Taken: East		
Description: Ash recovery area and conveyor in SP2.		





Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 5	Date: 10/6/10		
Direction Photo Taken: Northwest			
Description: Upstream slope of the SP2.			

Photo No. 6	Date: 10/6/10	
Direction Photo Taken: Southeast		
Description: Upstream slope of the SP2.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 7	Date: 10/6/10		
Direction Photo Taken: Southeast			
Description: Crest and downstream slope of the SP2.			

Photo No. 8	Date: 10/6/10	
Direction Photo Taken: North		
Description: Crest and downstream slope of the SP2.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 9	Date: 10/6/10		
Direction Photo Taken: East			
Description: Crest of the SP2.			

Photo No. 10	Date: 10/6/10	
Direction Photo Taken: Southeast		
Description: Crest of the SP2 showing erosion along the access road.		



Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 11	Date: 10/6/10	 A photograph showing a gravel-covered area. In the foreground, there are several large, dark, cylindrical pipes lying horizontally. To the right of the pipes, there is a concrete wall or barrier. The background shows a dirt road, some trees, and a body of water under a clear sky.	
Direction Photo Taken: East			
Description: Crest of the SP2 and pipelines transporting material to SP2.			

Photo No. 12	Date: 10/6/10	 A photograph showing a gravel-covered area, similar to the one in Photo 11. In the foreground, there are several large, dark, cylindrical pipes lying horizontally. To the right of the pipes, there is a concrete wall or barrier. The background shows a dirt road, some trees, and a body of water under a clear sky.
Direction Photo Taken: Southeast		
Description: Crest of the SP2 and pipelines transporting material to SP2.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 13	Date: 10/6/10		
Direction Photo Taken: West			
Description: Downstream slope of the SP2.			

Photo No. 14	Date: 10/6/10	
Direction Photo Taken: West		
Description: Downstream slope of the SP2.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 15	Date: 10/6/10		
Direction Photo Taken: Northwest			
Description: Downstream slope of SP2.			

Photo No. 16	Date: 10/6/10	
Direction Photo Taken: East		
Description: Erosion around an abutment on the downstream slope of the SP2.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 17	Date: 10/6/10		
Direction Photo Taken: Northeast			
Description: Downstream slope of the SP2.			

Photo No. 18	Date: 10/6/10	
Direction Photo Taken: Northeast		
Description: Downstream slope of the SP2 showing eroded slope.		



Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 19	Date: 10/6/10		
Direction Photo Taken: Northwest			
Description: Downstream slope of the SP2 with examples of the sloughing of the slope.			

Photo No. 20	Date: 10/6/10	
Direction Photo Taken: Northwest		
Description: Downstream slope of the SP2 showing the drainage ditch excavated into the toe.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 21	Date: 10/6/10	 A photograph showing a large industrial facility, likely a power plant, with tall smokestacks and complex piping. The facility is partially obscured by a dense line of trees and tall grass in the foreground. The sky is clear and blue.	
Direction Photo Taken: West			
Description: Trees present on the downstream slope of the northeast portion of the SP2.			

Photo No. 22	Date: 10/6/10	 A photograph showing a wide view of an industrial facility. In the center, there is a large white water tower on a metal frame. To the left, there is a tall, thin smokestack. To the right, there are several large green cylindrical tanks. The foreground is a grassy field. The sky is clear and blue.
Direction Photo Taken: Southwest		
Description: Downstream slope of the SP2.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 23	Date: 10/6/10		
Direction Photo Taken: Southeast			
Description: Downstream slope of the SP2.			

Photo No. 24	Date: 10/6/10	
Direction Photo Taken: Southwest		
Description: Erosion on the downstream slope of the SP2.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 25	Date: 10/6/10		
Direction Photo Taken: Southeast			
Description: Erosion of the downstream slope of the SP2.			

Photo No. 26	Date: 10/6/10	
Direction Photo Taken: South		
Description: Downstream slope of the SP2.		





Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 27	Date: 10/6/10		
Direction Photo Taken: Southwest			
Description: Decant structure in the SP2.			

Photo No. 28	Date: 10/6/10	
Direction Photo Taken: Southwest		
Description: Decant structure in SP2.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 29	Date: 10/6/10		
Direction Photo Taken: Northwest			
Description: Discharge pipe from the SP2 decant structure.			

Photo No. 30	Date: 10/6/10	
Direction Photo Taken: East		
Description: Pipelines from facility discharging into the SP2 area.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 31	Date: 10/6/10		
Direction Photo Taken: Southwest			
Description: Upstream area of the Slag Pond 1 Impoundment (SP1).			

Photo No. 32	Date: 10/6/10	
Direction Photo Taken: Southeast		
Description: Upstream area and crest of SP1.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 33	Date: 10/6/10		
Direction Photo Taken: Northwest			
Description: Long grass and trees present on the upstream areas of SP1.			

Photo No. 34	Date: 10/6/10	
Direction Photo Taken: Southwest		
Description: Crest of the SP1.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 35	Date: 10/6/10		
Direction Photo Taken: Northeast			
Description: Crest of the SP1.			

Photo No. 36	Date: 10/6/10	
Direction Photo Taken: Northeast		
Description: Crest of the SP1.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 37	Date: 10/6/10		
Direction Photo Taken: Southwest			
Description: Crest of the SP1.			

Photo No. 38	Date: 10/6/10	
Direction Photo Taken: North		
Description: Erosion on the downstream slope of the SP1.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 39	Date: 10/6/10		
Direction Photo Taken: Southeast			
Description: Erosion and trees on downstream slope of the SP1.			

Photo No. 40	Date: 10/6/10	
Direction Photo Taken: Southeast		
Description: Trees on downstream slope of the SP1.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 41	Date: 10/6/10		
Direction Photo Taken: Northeast			
Description: Eroded ditch on downstream slope of SP1.			

Photo No. 42	Date: 10/6/10	
Direction Photo Taken: Northeast		
Description: Discharge from SP1 to Raw Water Pond.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 43	Date: 10/6/10		
Direction Photo Taken: Northeast			
Description: Upstream area of the Ash Pond 1 impoundment (AP1).			

Photo No. 44	Date: 10/6/10	
Direction Photo Taken: Upstream area within the AP1 showing the pipelines discharging material.		
Description: Upstream		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 45	Date: 10/6/10		
Direction Photo Taken: South			
Description: Area within AP1 showing water drainage channel.			

Photo No. 46	Date: 10/6/10	
Direction Photo Taken: Southwest		
Description: Mounded ash with vegetation with the AP1.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 47	Date: 10/6/10		
Direction Photo Taken: Southeast			
Description: Mounded ash with vegetation with the AP1.			

Photo No. 48	Date: 10/6/10	
Direction Photo Taken: East		
Description: Mounded ash with vegetation with the AP1		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 49	Date: 10/6/10		
Direction Photo Taken: Northeast			
Description: Mounded ash with vegetation with the AP1			

Photo No. 50	Date: 10/6/10	
Direction Photo Taken: Northeast		
Description: Downstream slope of the AP1.		



Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 51	Date: 10/6/10		
Direction Photo Taken: Northeast			
Description: Erosion of downstream slope of the AP1.			

Photo No. 52	Date: 10/6/10		
Direction Photo Taken: Northeast			
Description: Downstream slope of the AP1.			




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 53	Date: 10/6/10		
Direction Photo Taken: Northeast			
Description: Downstream slope of the AP1.			

Photo No. 54	Date: 10/6/10	
Direction Photo Taken: Northeast		
Description: Downstream slope of the AP1.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 55	Date: 10/6/10		
Direction Photo Taken: North			
Description: Downstream slope of the AP1.			

Photo No. 56	Date: 10/6/10	
Direction Photo Taken: Northeast		
Description: Downstream slope of the AP1.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 57	Date: 10/6/10		
Direction Photo Taken: East			
Description: Downstream slope of the AP1 showing erosion of the slope and crest near the road abutment.			

Photo No. 58	Date: 10/6/10	
Direction Photo Taken: North		
Description: Discharge pipelines located on surface within the AP1.		



Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 59	Date: 10/6/10		
Direction Photo Taken: East			
Description: Pipelines discharging materials into the AP1.			

Photo No. 60	Date: 10/6/10	
Direction Photo Taken: East		
Description: Upstream slope of the Ash Pond 2 Impoundment (AP2).		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 61	Date: 10/6/10		
Direction Photo Taken: Southeast			
Description: Upstream slope of the AP2.			

Photo No. 62	Date: 10/6/10	
Direction Photo Taken: North		
Description: Upstream slope of the AP2 and the Pump Control building.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 63	Date: 10/6/10		
Direction Photo Taken: West			
Description: Upstream slope of the AP2.			

Photo No. 64	Date: 10/6/10	
Direction Photo Taken: Northwest		
Description: Upstream slope of the AP2.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 65	Date: 10/6/10		
Direction Photo Taken: West			
Description: Upstream slope and crest of the AP2.			

Photo No. 66	Date: 10/6/10	
Direction Photo Taken: East		
Description: Upstream slope and crest of the AP2.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 67	Date: 10/6/10		
Direction Photo Taken: Northwest			
Description: Upstream slope of the AP2.			

Photo No. 68	Date: 10/6/10	
Direction Photo Taken: Southwest		
Description: Upstream slope of the AP2 showing area where ash has been filled and graded to match the crest elevation.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 69	Date: 10/6/10		
Direction Photo Taken: Northeast			
Description: Upstream slope and crest of AP2.			

Photo No. 70	Date: 10/6/10	
Direction Photo Taken: Northeast		
Description: Upstream slope and crest of the AP2.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 71	Date: 10/6/10		
Direction Photo Taken: West			
Description: Crest of the AP2.			

Photo No. 72	Date: 10/6/10	
Direction Photo Taken: West		
Description: Crest of the AP2 showing an example of the erosion of the gravel access road.		



Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 73	Date: 10/6/10		
Direction Photo Taken: South			
Description: Erosion of the gravel access road on the crest of the AP2.			

Photo No. 74	Date: 10/6/10	
Direction Photo Taken: South		
Description: Downstream slope of the AP2.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 75	Date: 10/6/10		
Direction Photo Taken: South			
Description: Rutting of the downstream slope due to equipment.			

Photo No. 76	Date: 10/6/10	
Direction Photo Taken: North		
Description: Wave action erosion on the downstream slope of the AP2.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 77	Date: 10/6/10		
Direction Photo Taken: South			
Description: Downstream slope of the AP2 showing sparse vegetation typical of the slope.			

Photo No. 78	Date: 10/6/10	
Direction Photo Taken: North		
Description: Downstream slope near showing wave action erosion in southeast corner of the AP2.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 79	Date: 10/6/10		
Direction Photo Taken: West			
Description: Downstream slope of the AP2.			

Photo No. 80	Date: 10/6/10		
Direction Photo Taken: West			
Description: Downstream slope of the AP2.			




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 81	Date: 10/6/10		
Direction Photo Taken: West			
Description: Downstream slope of the AP2.			

Photo No. 82	Date: 10/6/10	
Direction Photo Taken: North		
Description: Downstream slope of the AP2.		




Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri		Project No. 01.0170142.20
Photo No. 83	Date: 10/6/10			
Direction Photo Taken: Northeast				
Description: Downstream slope of the AP2.				

Photo No. 84	Date: 10/6/10			
Direction Photo Taken: Southwest				
Description: Downstream slope of the AP2.				





Client Name: U.S. EPA		Site Location: New Madrid Generating Facility Marston, Missouri	Project No. 01.0170142.20
Photo No. 85	Date: 10/6/10		
Direction Photo Taken: Northeast			
Description: Downstream slope of the AP2 showing sloughing of the slope.			

Photo No. 86	Date: 10/6/10	
Direction Photo Taken: Southeast		
Description: Pipelines used to transfer water from the Make Up Water Pond to Ash Pond 2.		



Client Name: U.S. EPA

Site Location: New Madrid Generating Facility
Marston, Missouri

Project No.
01.0170142.20

Photo No.
87

Date:
10/6/10

**Direction Photo
Taken:**
Northeast

Description:
PAP





Appendix E

Reference List

REFERENCE LIST
NEW MADRID POWER PLANT
ROUND 7 DAM ASSESSMENT



AECI. "Fly Ash Pond Improvement Plan View W/Contours." Drawing No. N08909AA. Dated 1989.

AECI. "Ash Pond Grading Plan Cell No. 1" Drawing No. Y42." Dated September 18, 1992.

AECI. "Ash Pond Grading Plan Cell No. 2" Drawing No. Y43." Dated September 18, 1992.

AECI. "Response to Request for Information Under Section 104(e) of the Comprehensive Environmental Response, Compensation, and Liability Act" from AECI to EPA. Dated March 24, 2009.

COE ETL 1110-2-571 "Guidelines For Landscape Planting And Vegetation Management At Levees, Floodwalls, Embankment Dams, And Appurtenant Structures." Dated April 2009.

Geotechnology, Inc. "Global Stability Evaluation, Slag Pond 1 and Ash Pond 2, AECI New Madrid Power Generating Facility, New Madrid County, Missouri." Dated July 31, 2009.

SLT North America, Inc. "Ash Disposal Facility #1." Drawing No. 7520A. Dated July 7, 1993.

SLT North America, Inc. "Ash Disposal Facility #1." Drawing No. 7520B. Dated July 7, 1993.

Smith & Co. "Pond at Outfall 004." Drawing No. 6-16405-H. Dated December 30, 2005

Smith & Co. "AECI New Madrid Power Plant." Drawing No. 6-10604. Dated January 15, 2004.